THE ECONOMICS OF ADVERTISING: A Firm Level Study

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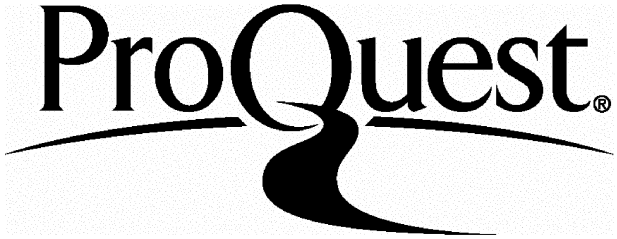
UNIVERSITY COLLEGE LONDON

1997

A Thesis Submitted for the Degree of Doctor of Philosophy at the University of London.



ABSTRACT

This thesis is concerned with the economic effects of advertising. Perhaps the most significant barrier to empirical work in the UK in this area is the lack of reliable, published data. Thus, at the heart of the thesis is a firm level questionnaire which provided advertising data on 325 large and medium-sized UK firms.

Following a review of the theoretical and empirical literature in the area, the main empirical part of the of the thesis begins with an analysis of the determinants of both the advertising decision by firms and their advertising intensity. In particular, the standard modelling of the inverse U-curve relating advertising to market structure is re-specified using survey data. Following on from this, the effect of advertising on firm profitability is investigated. Evidence is found that profitability is higher for firms in consumer based industries who advertise heavily. In addition, firms who do not advertise seem more likely to go into receivership than others. Related to the question of profitability effects, previous work that persistent effects of advertising disappear when firm fixed effects are taken into account is called into question.

On the question of persuasive and informative advertising, the evidence in the this study suggests that only a small proportion of firms include any information on prices in their advertisements. Consumer firms and those operating in a very competitive environment tend to be more likely to include at least some price information.

The last section of the thesis looks at the strategic use of advertising. Evidence is presented that many firms do adjust their advertising in response both to rivals and to changes in business conditions. In many cases, these responses are found to be asymmetric: increasing in response to booms or rival increases but not decreasing in response to recessions or rival decreases.

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ACKNOWLEDGEMENTS

There are many people who have helped me to complete this thesis. In the first place, I would like to thank the School of Economics at Kingston University who provided finance for the survey on which this research is based. Further funding towards the research over the last four years was provided by the Department of Economics and Politics at Nottingham Trent University. Paul Gregg deserves special thanks for his help in carrying out the survey, in particular providing company addresses and other data. Numerous people have provided a host of valuable comments on various parts of the thesis. Most notable amongst these are Andy Cooke, Steve Heasell, Leighton Vaughan Williams, Vaughan Galt, Mike Pearson, Tony Humm and Tony Dnes. In addition participants in seminars at University College London, Nottingham Trent University and at the 1996 Royal Economics Society Conference at Swansea made many useful suggestions. I am, of course, most grateful to my supervisors, Steve Machin and John van Reenan, for their advice, ideas and comments at all stages of the process. Lastly thanks go to my family for their support and, especially, to my wife, Paula, for her constant support, the hours she spent proof-reading and for helping me stay sane throughout.

DECLARATION

1. A version of Chapter 7 of the thesis was presented at the 1996 Royal Economic Society Conference in Swansea.

2. Chapter 8 was undertaken as joint work with my supervisor, Stephen Machin. As such I contributed at least 50% to this chapter. A statement from Dr Machin confirming this is given below.

I confirm the above declaration referring to joint work I have carried out with David Paton.

S. Machin

Stephen Machin

Chapter 1

INTRODUCTION

1.1 AIMS AND METHODOLOGY

This thesis is concerned with the economic effects of advertising. The dramatic increase in mass media advertising throughout this century has been accompanied by a growing body of research attempting to describe and analyze the impact which advertising has both on individual firms and consumers and on the economy as a whole. Research in the latter area has typically focused on welfare effects of advertising (e.g. Galbraith 1958, Becker & Murphy 1993), together with some empirical work on the impact on aggregate consumption such as that of Peel (1975).

At the microeconomic level, thinking on advertising has moved on somewhat from the view which sees it as changing consumer tastes, acting as a barrier to entry and consequently increasing the degree of monopoly power (e.g. Comanor & Wilson, 1967). Rather, the possibility that advertising may be a means of providing useful information has gained increasing acceptance. This may be direct information about a product or, as suggested by Nelson (1970, 1974), an indirect signal of the quality of the product. By providing consumers with information about a product's existence, entry into a market can be eased. Information on prices and product characteristics may increase consumer sensitivity and reduce the degree of monopoly power.

The two main focuses of this study are the determinants of advertising and its effect on company performance. Perhaps the most significant barrier to empirical work in

the UK is the lack of reliable published data on advertising[1]. Thus, at the heart of the study is the use of a company level survey undertaken during the summer of 1992. This survey asked the Advertising Managers of a large number of medium and large sized UK firms a variety of questions on the level and nature of their company's advertising. Useable data was obtained from a total of three hundred and twenty five firms.

The survey data is matched with a variety of accounting data available on the Microexstat and FAME databases[2], covering variables such as profits, sales and assets. In addition industry level data is obtained from the Census of Production. The result is a totally unique database incorporating quantitative information on, for example, advertising levels, as well as information of a more qualitative nature, covering areas such as conjectural responses to the possible decisions of rival firms.

Clearly there are problems with using managers' responses. Most obviously there is no guarantee that the questions were answered either carefully or accurately. On the other hand, they do provide very direct information which is unlikely to be available from published sources. In addition, the data allows for the empirical analysis of a variety of issues which would not otherwise be possible, in this country at least.

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[1]The limited data which has been published in the UK is discussed in Chapter Three.

[2]Microexstat is a database of accounts of about 3,000 UK companies, produced by EXTEL Financial Limited. FAME (Financial Analysis Made Easy) is a database of accounts of over 130,000 major public and private British companies, produced by Jordan's.

1.2 CHAPTER OUTLINE

The rest of the thesis is set out as follows.

Chapter Two sets the scene for the empirical part of the thesis by placing the work in the context of existing literature. A distinction is made between advertising used as persuasion and that which provides information. In particular, recent work showing how advertising can be used as a signal of quality is explained. Models which look at the implications of the nature of advertising for its effect on economic welfare are then discussed. The chapter concludes with a summary of empirical evidence on various questions related to advertising - its effect on barriers to entry, price, price sensitivity and direct measures of welfare.

The methodology of the survey is described in *Chapter Three* along with some summary statistics. Following a discussion of the problem of measuring advertising, responses are summarised across various sectors - producer goods, consumer non-durables, consumer durables, retail, finance and utilities. Tests for sample selection bias are carried out and some initial conclusions are drawn from the descriptive data.

Chapter Four concentrates on two main issues. The first is an analysis of which firms advertise and which do not. As a result of data limitations, the advertising decision has been left virtually untouched by the existing empirical literature. Here, probit estimation is used to investigate what factors influence this decision.

The second issue is the determination of advertising intensity. This has received

rather more attention in the past. One long-running theme has been concerned with the link between advertising and market concentration, most notably the "inverse U-curve" relationship. In this chapter, it is demonstrated how survey data may be used to shed more light on this topic which has become something of a sterile debate in recent years. The survey data approach is shown to compare favourably with that relying on standard published data sources.

The core of the debate about the welfare effects of advertising has been the impact on firm performance and this is the focus of *Chapter Five*. If advertising has an anti-competitive effect, then it should increase the monopoly profits of firms. The vast majority of studies have found just such a positive correlation at all levels of aggregation (market, firm and product) in consumer industries. However, a positive correlation could also be explained both by a reverse direction of causation running from profitability to advertising and by a (possibly) false specification of advertising as a current expense rather than as an investment good. These issues are discussed in some detail and attempts are made to take account of them in an empirical analysis of firm profitability. Lastly, a novel way of surmounting the potential problem of two-way causation is suggested, using company failure as an absolute measure of performance.

Following on from the issue of the appropriate specification for advertising, *Chapter Six* uses the sub-sample of firms who provided time-series data on total advertising expenditure, to estimate the durability of advertising. If the effects of advertising last significantly longer than one time period, then expenditure on it should be seen as an

investment in intangible capital rather than as a current cost. In this case profit rates require an appropriate adjustment. The majority of the work on this question has involved the use of a Koyck transformation on the advertising sales relationship. Recently it has been suggested such results may be biased by unobservable firm specific effects, such as product quality. An approach taking account of these fixed effects is replicated here. However, it is shown that advertising may be a more important component of these fixed effects than quality.

Chapter Seven looks in some detail at the advertising of prices. Several recent studies have analyzed the effects of price advertising and, in particular, the possibility that such advertising may signal quality information. To date, however, there has been no work looking at the decision by firms of how much price advertising to undertake. In this chapter, a simple model of this decision is developed, taking account of consumer search behaviour. The model is then tested against data collected from the survey using ordered probit estimation.

Some of the more interesting recent empirical work has focused on the strategic use of advertising, and, in particular, the responses to changes in rivals' strategies. *Chapter Eight* develops such work in two ways - firstly, by analysing the stated reaction of firms to changes in their rivals' advertising and secondly by considering the stated response of firms to changes in business conditions.

In *Chapter Nine*, the main themes of the dissertation are drawn together and some concluding remarks are made.

Chapter 2

ADVERTISING AND INDUSTRIAL ORGANISATION: an overview

2.1 INTRODUCTION

The analysis of advertising is of crucial importance to industrial organisation for several reasons. In the first place, there is the increasing attention which has been paid over recent years to the role of information in the competitive process. The potential for advertising to assist consumers in making the choices they want, or, alternatively, to influence consumers to make the choices firms would like them to make, has provided one of the main focuses of debate in the advertising literature.

Secondly, many authors have investigated the scope for firms to use advertising to shape the economic environment which they face. Examples are the work on advertising and barriers to entry and also on the nature of strategic interactions between firms operating in oligopolistic markets.

Thirdly, the level of spending by firms on advertising is such that the advertising decision has appeared worthy of study in its own right. Such studies have concentrated on the determinants of the level of advertising undertaken by firms and the reasons behind differences in advertising levels across industries and product groups.

The last issue will be put to one side until Chapter Four. In this chapter, an overview of existing work on the theoretical and empirical effects of advertising will be

presented in order to put into context the empirical study presented later in the dissertation. In the next two sections, the potential for advertising to affect consumers preferences and its role in providing useful information will be discussed. The implications for economic welfare will then be drawn out. In the final section of this chapter, an introduction to important empirical work in each area will be given.

2.2 PERSUASIVE ADVERTISING

Early work such as Kaldor (1949) and Bain (1968) emphasised the potential for advertising to give a monopolistic advantage to firms. The main mechanisms whereby this might occur are through the manipulation of consumer tastes, in particular the creation of perceived differences between products and, also, through the erection of barriers to entry into the market.

If consumers' preferences are altered by advertising, the price elasticity of the favoured good may be reduced. Cross-elasticity with close substitutes may also be lowered. In both cases, there is the potential of a higher markup of price over marginal cost and, consequently, increased allocative inefficiency.

The brand loyalty which this implies can also increase barriers to entry into the market. If an existing product possesses a large pool of goodwill, a new firm has to spend a large initial outlay on promotion for its own product or brand to compete in the market. Further, if advertising encourages the creation of strong brand images, incumbent firms may attempt to fill all market niches, making the market less attractive to potential newcomers. The extent to which advertising expenditure is a

sunk cost which is irrecoverable on exit will influence the effectiveness of the barrier to entry.

Another potential source of barriers to entry is in economies of scale in advertising itself. Schmalensee (1972) concludes that there is little evidence of economies of scale in terms of discounts for large advertisers, at least on television. There is rather more evidence of the existence of both a 'threshold effect' (Lambin, 1976; Albion & Farris, 1981), whereby advertising only begins to have an affect once a certain number of messages have been received, and technical economies (Peles, 1971; Brown, 1978). The latter arise from media such as television which require a very large outlay to advertise at all. Clearly both these factors disadvantage small entrants to a market.

Of course, there is no theoretical reason why a new firm cannot introduce new brands or spend money on building up customer loyalty, if necessary financed by credit. For advertising economies of scale to work as an effective barrier to entry requires other conditions such as capital market imperfections or a first-mover advantage.

Schmalensee (1983) was the first to include advertising as a form of investment in a Spence (1977) 'excess capacity' style model. Excess capacity can work as a deterrent as an increase in output by the incumbent is potentially a credible response to entry. In Schmalensee's model, however, advertising increases loyalty to the incumbent's product. Increasing output in response to entry would then require a decrease in price and the loss of profits from the 'loyal' consumers. Intensive advertising is then

perceived as a 'fat-cat' strategy (Lyons, 1989) in which the potential newcomer predicts an accommodating post-entry response and entry becomes more likely.

Bagwell and Ramey (1988) derive conditions under which advertising will be used by incumbent firms as a signal of absolute cost advantages to put off potential entrants from the market. In their model, the incumbent's costs may be high (H) or low (L), but they are unknown to the potential entrant. The latter makes the entry decision on the basis of the incumbent's observed price (P) and advertising (A) levels in the first period. In the first period, profits are denoted by $\pi_H(P,A)$ and $\pi_L(P,A)$ for a high and low cost incumbent respectively. If entry occurs, the two firms share duopoly profits in the second period. Otherwise, the incumbent earns monopoly profits.

It is assumed that the duopoly profits accruing to the entrant would cover its fixed costs of entry (F) if the incumbent has high costs, but not if it has low costs:

$$\pi_{HE} - F > 0 > \pi_{LE} - F \qquad (2.1)$$

A low cost incumbent attempts to set price and advertising levels which would not be worthwhile to a high cost firm. For an equilibrium in which entry is impeded, there must be a price and advertising combination for a low-cost incumbent which would not be imitated by a high cost firm. In addition, the return from signalling that a firm is low-cost must be greater than that achieved by making monopoly profits in the first period and allowing entry.

Formally, the following two conditions must be satisfied for signalling to occur:

$$\pi_H(P_{LS}, A_{LS}) + \delta\pi_H(P_{HM}, A_{HM}) \leq \pi_H(P_{HM}, A_{HM}) + \delta\pi_{HD} \quad (2.2)$$

$$\pi(P_{LS}, A_{LS}) + \delta\pi_L(P_{LM}, A_{LM}) \geq \pi_L(P_{LM}, A_{LM}) + \delta\pi_{LD} \quad (2.3)$$

where δ is the rate at which period 2 profits are discounted.

subscript S represents signalling prices and advertising.

subscript M represents monopoly prices and advertising.

subscript D represents duopoly profits made in period 2.

If the profit maximising choices of price and advertising for a low-cost incumbent satisfy both (2.2) and (2.3), then profit maximisation will successfully deter entry. Otherwise, the firm may attempt to signal the fact that it has low costs. Bagwell and Ramey show that advertising will only be used as a signal if it also shifts the demand curve for the firm. In this case, the firm sacrifices profits in order to choose a (lower) price and (higher) advertising combination that suggests lower costs than it actually has.

2.3 ADVERTISING AND INFORMATION

Contrasting with this view of advertising as a persuasive mechanism is one which sees advertising as a way of providing consumers with useful information about the existence and location of both products and firms.

A useful distinction is made by Nelson (1970, 1974) between search and experience goods. The former are characterised by goods that have tangible characteristics such as size, power or other specifications that can be described objectively. Experience

goods are characterised by subjective or intangible qualities which can only be ascertained by purchasing and consuming that good.

In the case of the latter, advertising is one way in which useful information about seller location, product price and quality can be provided. In Stigler's seminal article (Stigler, 1961) the equilibrium level of consumer search is determined by the marginal cost and benefit of that search. Advertising for goods which are characterised by a larger amount of consumer search is likely to be restricted to factual information. For experience goods where search is less useful, advertising is more likely to be persuasive.

Nelson (1974) suggests that advertising may be informative even in the case of experience goods. Essentially, the argument is as follows. High quality goods are more likely to be advertised than goods of low quality as producers of the former expect first time purchasers to be satisfied and to make repeat purchases. Realising this, consumers may perceive heavy advertising as being a signal of the firm's commitment to attracting repeat customers and thus as a signal of quality.

This idea has been formalised by, amongst others[3], Milgrom and Roberts (1986) who consider a strict experience good. In other words, consumers only realise the quality of the good after purchase. The product quality is low with probability L and high with probability H, where $0 < L < 1$ and $L + H = 1$. Consumers are prepared to

[3]Alternative models which demonstrate how advertising can signal information can be found in Schmalensee (1978) and Kihlstrom and Riordan (1984).

pay more for goods which they believe to be of high quality. The only role of advertising is to signal to consumers which goods are of high quality.

The firm's pay off is determined by the price, the product quality and consumers beliefs about the product quality. In particular, $\pi(P,L,L)$ is the pre-advertising profit for a firm whose product is both low quality and believed by consumers to be low quality, $\pi(P,L,H)$ is the profit for a firm whose product is low quality but believed by consumers to be of high quality and so on. In each case, there is a price that will maximise the payoff given by P_{LL}, P_{LH} and so on.

Clearly there may be an incentive for a low quality firm to suggest to consumers that it is high quality. Consequently, true high quality firms have an incentive to choose a price and advertising combination that would be unprofitable for a low quality firm. If consumers have sufficient information to identify unprofitable combinations for low quality firms, then price and advertising combinations can signal product quality successfully.

Let expenditure on advertising be denoted by A. The payoff for a high quality firm who successfully uses advertising to persuade consumers that its product is of high quality is given by $\pi(P,H,H)$ - A. If the firm does not advertise, the worst that can happen is that consumers mistakenly believe that the good is of low quality and the payoff will be $\pi(P_{HL},H,L)$. A necessary condition for advertising is that P and A can be chosen such that:

$$\pi(P,H,H) - A \geq \pi(P_{HL},H,L) \tag{2.4}$$

Similarly, a low quality firm using advertising to persuade consumers (wrongly) that it is high quality receives a payoff of π(P,L,H) - A. Again, the worst scenario for this firm if it does not advertise is that consumers correctly believe that its product is of low quality. In this case the payoff will be $\pi(P_{LL},L,L)$. The firm will not be prepared to advertise if there is no choice of P and A for which:

$$\pi(P_{LL},L,L) \geq \pi(P,L,H) - A \tag{2.5}$$

(2.4) and (2.5) can be combined into one condition under which high quality firms will choose a price and advertising combination that low quality firms will not want to copy:

$$\pi(P,H,H) - \pi(P_{HL},H,L) \geq A \geq \pi(P,L,H) - \pi(P_{LL},L,L) \tag{2.6}$$

If this condition is met, a high quality firm maximises its profits subject to the constraint that it has revealed the quality of its product. That is:

$$\max_{P,A} \pi(P,H,H) - A \qquad \text{subject to} \quad \pi(P,L,H) - A \leq \pi(P_{LL},L,L) \quad P,A \geq 0 \tag{2.7}$$

As long as A > 0, the equilibrium occurs where the first constraint is just satisfied. The reason is that, if the profits to the low quality firm are greater without advertising, it is always worth the high quality firm reducing advertising slightly and gaining more profit. This implies:

$$A = \pi(P,L,H) - \pi(P_{LL},L,L) > 0 \tag{2.8}$$

Milgrom and Roberts show that the problem is now:

$$\frac{Max}{P}\pi(P,H,H) - \pi(P,L,H) \quad subject\ to \quad \pi(P_{LL},L,L) > 0 \quad and \quad P \geq 0 \qquad (2.9)$$

The isoprofit curve for the high quality firm at profit level m is given by π(P,H,H) - c_A.A = m. That for the low quality firm at profit level n is given by: π (P,L,H) - c_A.A = n. The solution to the maximisation problem is at $\partial\pi$(P,H,H)/∂P = $\partial\pi$(P,L,H)/∂P. That is, where the two isoprofit lines are at a point of tangency.

There may be a signalling equilibrium that involves no advertising or there may be a combined signal involving both price and advertising. Milgrom and Roberts show that this equilibrium can occur either at $P_{HH} > P_{LH}$ or at $P_{HH} < P_{LH}$. In other words, the price may be lower or higher than the high quality firm would choose in the absence of any need for signalling. When there is a need, then signalling through price and advertising is cheaper than that via price alone. If advertising were to be banned, prices will rise for consumers, whilst profits will fall for H and be unchanged for L - a pareto-worsening effect (p.813).

A key factor in this analysis is the important role of consumers who must be able to distinguish quite complex conditions for the signalling equilibrium to be credible. Authors who have developed this style of analysis include Bagwell and Ramey (1994) and Herzendorf (1993). The former argue that advertising which successfully signals information will lead to 'coordination economies' which reduce selling costs and lower prices whilst the latter derives conditions in which advertising by the low quality producer is worthwhile.

Horstmann and MacDonald (1994) argue that Milgrom/Roberts type models are deficient in several ways. In particular, they focus on the implicit assumption that "consumers' experience plays no independent role in shaping subsequent consumption behaviour" (p.562). They argue that, under this assumption, there is no need for advertising after the initial period when the product is introduced. Further, the payoff to high quality firms who advertise must be equal in equilibrium to those of low-quality, non advertising firms (p.563). However both these conclusions are at odds with empirical evidence such as the well-established, positive correlation between advertising and firm profitability (see Chapter Five below). In Horstmann and MacDonald's alternative model, advertising is not able to signal the quality of new products at all. It may provide some information about the quality of established goods but the signal will be imperfect leaving some consumer uncertainty.

2.4 WELFARE EFFECTS OF ADVERTISING

Work into the welfare effects of advertising can be differentiated firstly according to whether advertising is seen as informative or persuasive and secondly according to the theoretical setting for the advertising decision. Dixit and Norman (1978) look at persuasive advertising using a representative consumer approach. Grossman and Shapiro (1984) consider informative advertising using a product characteristics approach based on Lancaster (1966) and Salop (1979). In an interesting recent development, Becker and Murphy (1993) take the view that non-informative advertising should be seen as a good (albeit one that may attract a negative price) that does not change tastes but enters the fixed preferences of consumers. These three models can be seen as representative of the flavour of work on advertising and

welfare and are considered in more detail in turn.

2.4.1 Persuasive Advertising and Welfare

Dixit and Norman (1978) treat advertising as shifting the social welfare function which is denoted as:

$$U(m,q,A) = m + u(q,A) \tag{2.10}$$

where q is the quantity produced of a good that is advertised by amount A.

m is the quantity consumed of all other (non advertised) goods.

There are two constraints to maximising this utility function. The first is that the value of the inputs used to produce all goods, including advertising, is equal to the total resources in the economy. Formally, if the price of goods m are normalised, then:

$$m + F + c.q + c_A.A = R \tag{2.11}$$

where c_A is the unit advertising cost.

F is the fixed costs of producing q.

c is the constant marginal cost.

R are total resources in the economy.

The second constraint is that expenditure by consumers just equals income. If the price of the advertised good is given by P, then,

$$m + P.q = R \tag{2.12}$$

The profit function for a monopolist is given by:

$$\pi(q,A) = [P(q,A) - c].q - F - c_A.A \qquad (2.13)$$

If advertising is fixed at a level A, the profit maximising output, q*(A), can be derived. The welfare of society, W, is given by the level of utility provided to society by the choices of A and q*:

$$\begin{aligned} W\ (q^*(A),A) &= U\ (m,q^*(A),A) \\ &= m + u(q^*(A),A) \\ &= R - cq^*(A) - F - c_A + u(q^*(A),A) \end{aligned}$$

Substituting in the profit function, this becomes:

$$W = u[q^*(A),A] - p[q^*(A),A].q^*(A) + \pi[q^*(A),A] + R \qquad (2.14)$$

The problem with using this welfare function to measure changes in A are that A itself changes the social welfare function we are measuring against. To get around this, Dixit and Norman fix the level of advertising in the utility function at a level A_1. The utility function is now treated as constant and the effect of small changes in advertising can be measured.

Differentiating with respect to A gives:

$$\begin{aligned} \frac{\delta W[q^*(A),A_1]}{\delta A} &= \{u_q[q^*(A),A_1] - P\}.\frac{dq^*(A)}{dA} \\ &\quad + q^*(A).\frac{dp[q^*(A),A]}{dA} + \frac{\delta\pi[q^*(A),A]}{\delta A} \end{aligned} \qquad (2.15)$$

The last term must equal zero to satisfy profit maximising by the firm. In addition, $u_q(q^*(A), A_1)$ is also the inverse demand curve (see Martin, 1993 p.136) and therefore equal to P. Thus, equation (2.15) reduces to:

$$\frac{\delta W}{\delta A} = -q^* \cdot \frac{dP}{dA} \qquad (2.16)$$

The effect of advertising on welfare depends, therefore, on its effect on price. If advertising causes the price to go up, then a reduction in advertising would be welfare improving. In the case of a monopolist considered here, advertising can shift the demand curve out and increase price. This is Dixit and Norman's key result: in the presence of market power, the equilibrium level of advertising is excessive from a social welfare point of view. They show this to be the case whether welfare is measured using pre- or post-advertising tastes.

The result has been subject to several attacks. Fisher and McGowan (1979) argue that Dixit and Norman do not take into account advertising that enters into the utility function. In their example, an advertisement for cognac may increase the enjoyment of the product by associating it with high status. Thus advertising can increase the utility gained from consumption of a good.

A further criticism comes from Shapiro (1980) who argues that the Dixit and Norman approach is deficient in that it assumes that consumption in the absence of advertising is distributed perfectly. If consumers are not perfectly informed, this will not be the case and the question of whether pre- or post-advertising tastes are used to judge welfare effects becomes crucial. On the basis of pre-advertising tastes, advertising will be excessive, whilst it will be insufficient (from a social welfare point of view) if post-advertising tastes are used. This line of argument has been subject to a great

deal of debate and is discussed below[4].

2.4.2 Informative Advertising and Welfare

Butters (1977) was one of the first to consider the welfare effects of informative advertising, concluding that under monopolistic competition, advertising is at a socially optimal level. Several authors have drawn on the approach of Butters, for example, Stahl (1994) and Grossman and Shapiro (1984). Here I will concentrate on the latter who look at welfare effects in the context of a product differentiation model. There are n firms producing heterogeneous products. Different customers prefer different product characteristics and advertisements play a role in providing information on variations between products. Benefits can accrue to society from better matching of products to consumers.

In the Grossman and Shapiro model, there is a circle of product characteristics. Each consumer has a preferred point on this circle which gives them a value, v. Consumers are distributed uniformly at a density of δ per unit length. A product which is located a distance of z away from v provides a value of (v - tz) where t is the transport cost per unit distance. t can be thought of as the sensitivity of consumers to product characteristics which are different to that desired.

Consumer surplus is given by (v - tz - P), where P is the price of the product. Consumers are assumed to select the product which yields the biggest surplus.

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[4]For a direct reply to both the Fisher and McGowan and the Shapiro criticisms, see Dixit and Norman (1979) and Dixit and Norman (1980) respectively.

Consumers may be aware of which products exist, but they do not know where each product is on the product circle. Search is prohibitively expensive, leaving advertising as the only way of finding out product information.

Advertising is assumed to be truthful and its cost is defined as $A = A(\phi,\delta)$, where ϕ is the distance the advertisement is sent ($0 \leq \phi \leq 1$). ϕ can be thought of as the probability any consumer receives an advertisement.

The socially optimal level of advertising is that which maximises welfare (W), defined as the sum of consumer and producer surplus:

$$W = (P - c + v - tz - P)\delta[1 - (1 - \phi)]^n - n.F - n.\delta.A(\phi) \qquad (2.17)$$

where c is the variable cost of production.

$[1 - (1 - \phi)^n]$ is the proportion of customers reached by advertisements.

n.F are the fixed costs of production.

$n.\delta.A(\phi)$ is the cost of advertising.

If total transport costs are denoted by T, equation (2.17) reduces to:

$$W = (v - c).\delta.[1 - (1 - \phi)^n] - n.F - n.\delta.A(\phi) - T \qquad (2.18)$$

The equilibrium provision of advertising (compared to the socially optimal level) is considered in several ways. Firstly, advertising is insufficient to the extent it reaches consumers who would otherwise be uninformed. Taking the case of a monopolist, the marginal profit gained from obtaining another sale through advertising is (P - c). However the social benefit must also include the extra consumer surplus, (v - c - tz).

Thus monopolists will provide too little advertising.

When there is more than one firm, there are two additional and opposing considerations. Firstly there is an external benefit of improved matching which accrues to a consumer who receives an advert from a second firm[5]. Secondly, there is a counteracting tendency towards over provision which occurs as firms do not take account of lower profits in the rival firms from which they have attracted customers - the "customer capture effect" (Grossman and Shapiro, 1984, p.75).

By comparing the socially optimal level of advertising with the equilibrium level, Grossman and Shapiro find that, in an oligopoly situation, the matching effect is outweighed by the capture effect. In other words, advertising is excessive when there are a sufficiently large number of firms.

Clearly there can be a thin line between information and persuasion. For example, Nagler (1993) shows that in the absence of perfect information, firms may have an incentive to advertise deceptively. The beneficial Grossman-Shapiro type welfare effects will not follow if consumers display "cognitive dissonance". That is, they convince themselves that purchasing the good in question was not a mistake in order to save face.

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[5]This is not dissimilar to market failure in research and development (R and D) discussed in Arrow (1962). Once information is in the public domain, firms are unable to gain all the rents from their R and D. Thus resources allocated to R and D may be less than optimal.

2.4.3 Advertising as a Complementary Good

Becker and Murphy (1993) draw out some problems with the signalling view of advertising presented by authors such as Milgrom & Roberts (1986). They argue that, taken literally, advertisements which signal information do not need to be seen - people simply need to know that they exist. Thus as long as firms' advertising expenditure is broadcast (which it generally is not), consumers will be able to distinguish quality.

Further, consumers are willing to pay for some advertisements: directly in the case of some print advertisements (such as "Free Ad" papers) and indirectly where the advertisement is sold jointly with other content of newspapers or magazines. However some advertisements (e.g. posters, television and radio) are quite clearly given away or 'sold' at a negative price. This suggests that such advertisements lower consumer's utility which is difficult to reconcile with the information view. Becker and Murphy suggest that casual observation provides evidence of advertisements campaigns (such as those for chewing gum, cereal, beer and cola) which are not associated with the provision of any sort of information.

On the other hand, Becker and Murphy follow Fisher and McGowan (1979) in arguing that it is incorrect to see non-informative advertisements as changing tastes. Rather, when advertising increases the demand for a good such as a brand of lager, it should be treated as a complementary good to the lager and not as something that shifts the consumer's utility functions.

Formally they consider two goods, x and y. The former is subject to a quantity of advertising, A. Utility is given by:

$$U = U(x, y, A) \tag{2.19}$$

where an increase in A is assumed to increase the marginal utility of x.

They do not make the usual assumption that producers give away a limited number of advertisements for free, arguing that in the case of newspapers, for example, advertisements are "not rationed" and are subject to an implicit price which "is measured by the difference between the actual cost of newspapers to consumers and what it would be if papers did not have the ads." (p.946). This implicit price may be negative, suggesting that advertising is a 'bad' for which consumers need compensating. When there is a negative price, producers clearly do have an incentive to ration the number of advertisements that consumers 'buy'.

Becker & Murphy measure total welfare (W) in the standard way as the sum of producer surplus (π) and consumer surplus (S):

$$W = \pi(A, P_x, R) + S(A, P_x, R) \tag{2.20}$$

where P_x is the price of good x and R is the revenue from selling A.

Differentiating with respect to A gives:

$$\frac{dW}{dA} = \pi_A + \pi_{Px} \cdot \frac{dP_x}{dA} + \pi_R \cdot \frac{dR}{dA} + S_A + S_{Px} \cdot \frac{dP_x}{dA} + S_R \cdot \frac{dR}{dA} \tag{2.21}$$

where subscripts indicate partial differentials as follows:

$$\pi_{Px} = x;\ \pi_R = 1;\ S_R = -1;\ S_{Px} = -x.$$

Also:

$$\pi_A = (P_x - mc_x).\frac{dx}{dA} - mc_A \qquad (2.22)$$

where mc_x is the marginal cost of good x and mc_A is the marginal cost of advertising.

Equation (2.21) now reduces to:

$$\frac{dW}{dA} = (P_x - mc_x).\frac{dx}{dA} - mc_A + S_A \qquad (2.23)$$

Advertising is excessive (insufficient) if a small increase reduces (increases) welfare. As under profit maximisation, $d\pi/dA = 0$, the condition for excessive advertising is:

$$S_A - x.\frac{dP_x}{dA} - \frac{dR}{dA} < 0 \qquad (2.24)$$

Advertising is insufficient if:

$$S_A - x.\frac{dP_x}{dA} - \frac{dR}{dA} > 0 \qquad (2.25)$$

Becker and Murphy show that if the equilibrium price of x falls with advertising, then advertising is insufficient whatever its effects on consumer utility. This contrasts somewhat with the Dixit and Norman result (discussed above) that advertising is always excessive if it raises prices. The latter conclusion is dependent on the assumptions that S_A (the utility of advertisements to consumers) is zero and that advertisements are given away. Looking purely at consumer welfare, Becker and Murphy argue that advertisements that are given away (or sold at a negative price),

such as those on television and radio, are more likely to reduce utility than print advertisements.

2.5 EMPIRICAL EVIDENCE

Empirical tests on the effects of advertising have tended to look at intermediate signals of welfare such as entry, price elasticity and prices rather than attempting direct estimates of welfare changes. A summary of work in each area now follows.

2.5.1 Barriers To Entry and Market Concentration

There is a wide range of studies providing evidence of advertising both as a barrier to, and facilitator of, entry. Rosenbaum and Lamort (1992) investigate entry in 4-digit US manufacturing industries over two separate time periods and find that "markets with advertising to sales ratios have significantly lower entry rates than markets with low advertising to sales ratios" (p.303), a conclusion backed up by Rizzo and Zeckhauser (1990) in the context of the medical profession.

On the other hand, Kessides (1986) finds that although advertising acts as a sunk cost and increases the risks of entering markets, there is an opposing tendency for potential entrants to perceive there to be a greater likelihood of success in markets where advertising is important. Overall he concludes that entry into most US manufacturing industries has been aided by advertising. Geroski and Murfin (1991) reveal a typically varied picture in the UK car industry since 1968. In the early years, advertising is found to have aided entry into the market. Subsequently, however, it made life extremely difficult for potential newcomers.

In another approach, Cubbin and Domberger (1988) find evidence amongst consumer firms in the UK of a strong advertising response to entry by dominant firms. An advertising strategy to deter entry was most commonly found in static industries where other barriers to entry are already present. This is backed up by evidence from the US breakfast cereal market given by Thomas (1996) that managers credibly invest in advertising as a sunk cost with the intention of deterring entry.

Sutton (1991) presents a detailed investigation of entry conditions in twenty food and drinks industries. In industries in which advertising competition is important, concentration is lower bounded as market size increases, whereas no such bound exists where advertising is not important. Advertising is seen as having an effect in restricting entry as an endogenous factor rather than as the exogenous barrier to entry of traditional structure-conduct-performance models.

Sutton's results are largely backed up by Robinson and Chang's (1996) study of a wider variety of both producer and consumer markets. They find that the lower bound for concentration is lowest in markets where advertising is not important and "in relatively large markets, entry is effectively blockaded" (p.390).

Several authors have focused on the consequences for market structure, looking in particular at the link between advertising and concentration. Casual observation suggests that markets dominated by very few large firms tend to be typified by very intensive advertising. Evidence that advertising causes an increase in concentration is

provided by, amongst others, Cowling et. al. (1975) and Mueller and Rogers (1980)[6].

There have been few negative associations found, suggesting a lack of evidence for the view that advertising aids entry into markets. A recent exception is the study by Sass and Saurman (1995) who find that small brewers in the USA are significantly disadvantaged by advertising restrictions compared to larger brewers.

The problem with such studies is that there are strong theoretical grounds for causality going the other way. That is, high market concentration may lead to high advertising intensity[7]. In turn this means single equation models may be subject to a bias. The use of simultaneous equation techniques may get around this problem and Comanor and Wilson (1974), Strickland and Weiss (1978), Geroski (1982), Uri (1987) and Rosenbaum (1993) are among those who employ such methods and still find a significant effect for advertising on market structure. Martin (1986), on the other hand, finds no significant effect.

An important issue in such studies is the question of identification. Schmalensee (1989, p.953-6) suggests that it is questionable whether any structure-conduct-performance equation systems are truly identified. To see this, consider a system k endogenous variables. For an equation within the system to be identified, there must be at least k exogenous variables that can be excluded from the equation on theoretical grounds and used as instrumental variables. In the long run, all structural variables

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[6]Mueller and Rogers find a positive effect only for television advertising.

[7]This is explored in more detail in Chapter Four

(such as concentration) are affected in some way by conduct and/or performance variables (such as business strategy). Thus no variables are truly exogenous in the long run and there are no theoretically valid instruments.[8]

2.5.2 Price Sensitivity and Absolute Prices

There is somewhat more agreement on the impact on price sensitivity. Several authors (Comanor and Wilson, 1974; Lambin, 1976; Pagoulatis and Sorenson, 1986) have found that advertising significantly reduces price elasticity in manufacturing industries. In distribution industries, the effect seems to be reversed (Eskin, 1975; Wittink, 1977). This accords with casual observation. For example, print advertisements by supermarkets in particular tend to be concerned with price comparisons. An exception is given by Shankar and Krishnamurthi (1996). They find that intensive advertising by those retailers who follow an "every day low pricing" policy (p.250) is associated with lower price elasticity. A further distinction based on firms facing a strong or weak competitive reaction from rivals is made by Kim (1996). Only in the case of the former is there a positive effect of advertising on price sensitivity.

A line of research that is attractive both intuitively and theoretically is to look at the effect of advertising on price. The seminal study in this vein is that by Benham (1972) who found that spectacles were significantly cheaper in states in the USA where advertising was allowed compare to those states in which it was banned. This result has been confirmed by Kwoka (1984) in the USA, by The Office of Fair

[8]See Martin (1993 pp.522-8) for a dissenting view.

Trading (1982) in the UK and, for the legal profession in the USA, by Cox, Deserpa and Canby (1982). Eckard (1987) looks at a range of US industries and finds that prices in those industries characterised by heavy television advertising fell between 1963 and 1977 relative to others.

Contrasting results are found by the Rizzo and Zeckhauser (1992) study of doctors in the USA. Their explanation is that doctors advertise in order to attract premium patients. The result is both higher quality and prices, but lower equilibrium output. There is both casual and hard evidence (see, for example, Connor and Peterson, 1992; Nickell and Metcalf, 1978) that heavily advertised brands attract a premium over rivals. However, this does not necessarily imply a simple effect on welfare as there may be a quality premium, whether real or perceived on advertised branded goods. For example, Wiggins and Raboy (1996) find that price premia for brand names in the market for bananas are largely due to real quality differences rather than subjective product differentiation. However, their study focuses on sales to large supermarkets rather than to final consumers and advertising is concentrated in the trade press. As argued below, it is in precisely such circumstances that advertising is likely to be informative rather than persuasive.

A useful summary of work in the area is provided in a survey article by Kaul and Wittink (1995). They conclude that price advertising leads to both lower prices and higher price sensitivity, whilst non-price advertising causes lower price sensitivity. To give one example, Popkowski and Rao (1990) find that advertising at the local level (which is characterised by a large amount of price information) increases

elasticity, whilst that at the national level has the opposite effect. The specific issue of price advertising is explored in more detail in Chapter Seven.

Although plausible, a negative association between advertising and prices is not conclusive evidence in favour of advertising improving welfare. Lal and Matutes (1994) argue that supermarkets may advertise loss-leaders in order to entice consumers into the store. Profit margins are then made up on more expensive goods that are not advertised. In a similar vein, the above evidence that advertising increases price sensitivity in the short run in distribution is consistent with a longer run effect of decreased price sensitivity as consumers become loyal to one chain of shops. Indeed, the distinction between short and long run price effects would seem to be an avenue worthy of future research.

Clearly both barriers to entry and price effects will impact on firm profitability. A detailed discussion of the theoretical and empirical evidence in this area is left until Chapter Five. However, Schmalensee (1989) concludes that the majority of studies in this area have found a positive correlation between profitability and advertising (at industry level at least) in the consumer goods sector.

2.5.3 Direct Measurements of Welfare

Tremblay and Tremblay (1995) is one of the few papers to estimate directly the social welfare effects of advertising. They look at cigarette advertising in the USA over 1955 to 1990 from the standpoint of three different views of advertising: persuasive, information and the "image creation" view of Fisher and McGowan (1979). Using a

fairly standard consumer welfare model they estimate the effect of advertising on consumer, producer and total surplus under the three different scenarios. They find that advertising has a strictly negative effect on total welfare if it is either purely persuasive or purely informative, with estimates ranging from a 1.6 to 4.3 cents decrease in welfare per adult per year arising from a 1% increase in advertising. In the case of image creation advertising, welfare increases by between 43 and 45 cents per adult per year. None of these estimates, however, are significantly different from zero. When the health effects of increased smoking are taken into account, the negative effects of informative and persuasive advertising views are reinforced and the positive effects found on the image creation view are nearly all wiped out.

Mitra and Lynch (1995, 1996) employ experimental evidence to analyze advertising effects on welfare. Their method is to expose groups of marketing students to different levels of advertising and then to study their consumption behaviour. They find that price sensitivity is reduced and prices are higher when advertising manages to differentiate between brands and in purchasing situations in which it is not essential to recall brand names. On the other hand when brand name recall is important, advertising increases the set of choices available to consumers and prices are reduced. Even when it leads to higher prices, advertising can increase consumer welfare if it enables consumers to be matched more closely to their preferred brands.

Caves and Greene (1996) take a different approach, using rankings by consumer organisations to rank brands according to quality, and then investigating the correlation of quality with advertising. They find a positive correlation only in the

context of easily verifiable quality attributes. There seems to be no evidence of advertising signalling quality in the way envisaged by Milgrom and Roberts (1986) and discussed above.

2.6 CONCLUSIONS

Researchers have taken a wide range of approaches in trying to judge the effects of advertising. Structural features such as market concentration and entry barriers have attracted a good deal of attention with contradictory conclusions. Perhaps the simplest and most appealing approach as far as policy makers are concerned is to focus directly on the effect of advertising on price. There is strong, but not conclusive, evidence both that advertising does reduce prices in the professions and that heavily advertised consumer goods are priced at a premium. On the other hand evidence of a correlation between advertising and quality has not yet been forthcoming.

The fact that research into many of the important questions has yielded very few results which are unambiguous in their policy implications is not perhaps a cause for concern. The Tremblay and Tremblay study is useful in demonstrating clearly how the welfare effects depend very much on the way in which advertising is treated. Whether advertising alters consumer preferences or helps consumers to achieve them is, in part at least, a normative issue. Further, the acceptance of one interpretation in some circumstances, does not exclude the possibility of the another being appropriate in different cases.

Chapter 3

SURVEY METHODOLOGY AND SUMMARY STATISTICS

3.1 INTRODUCTION

This chapter provides a statistical overview of a firm level questionnaire survey, carried out in the summer of 1992. In addition to an introduction to the questionnaire and the survey process, it gives a broad summary of the data collected, concentrating on differences between industry groupings.

UK data on advertising is notoriously poor. The only regular source of information on advertising expenditure in the UK (published by MEAL - Media Expenditure Analysis Limited) is at brand level. Uniquely, the 1968 Census of Production reported advertising expenditure by Minimum List Heading three digit industry. UK industry studies have continued to use this 1968 data ever since (see for example, Geroski and Pomroy, 1990)[9]. The Campaign Report aggregates the MEAL data to the firm level for its annual list of the 100 top advertisers and it is also incorporated into Advertising Association Annual Statistics series. Unlike in the US[10], there is no comprehensive, primary source of firm level advertising data in the UK and, in essence, this is the prime motivation for this survey. The explosion of theoretical models of advertising in recent years has been ill-served by the amount of empirical

[9]Dowrick (1990) uses "other non-industrial costs" from the Census of Production Summary Volume as a proxy for advertising at the SIC 3-digit level for manufacturing industries.

[10]The provision of advertising data in the US is by no means perfect. See Rogers and Tokle (1995) for a recent discussion.

work in this country at least.

Further, much of the recent theory has concentrated on the strategic use of advertising:- interactions between firms, entry deterrence, competitive strategies etc. Whatever the standard of published statistics, surveys provide one of the few ways of getting hold of the fairly specific information which is needed to test such theories. Smiley (1988) and Singh, Utton and Waterson (1991) both describe surveys aimed at eliciting information on more general strategic actions by firms. To date, there has been no attempt to undertake a similar survey concentrating on advertising.

The validity of responses to questionnaires such as this is, of course, open to question. There is no guarantee that questions will be answered either accurately or truthfully. On the other hand, at best they do give an idea of managers' own perceptions (as opposed to the interpretation of a researcher) of their advertising behaviour.

The rest of the chapter is set out as follows. Section 3.2 outlines the surveying process and gives information on response rates. In addition some tests for sample selection bias are reported. Section 3.3 places the survey questions in the context of basic advertising theory and reports descriptive statistics of the replies. Information gained from the questionnaire can be thought of as lying within two broad areas. Firstly, there are those answers which provide mainly descriptive data, for example advertising levels and media trends over time. These are discussed in sections 3.3.1 to 3.3.5. Secondly, there are answers which provide information on the strategic use of advertising - whether it is seen as competitive, response to rivals and so on. This

set of responses is covered in Section 3.3.6. Lastly, some concluding remarks are made in section 3.4.

3.2 THE SURVEYING PROCESS AND RESPONSE

3.2.1 Surveying Process

A pilot sample of 25 companies, taken from the Microexstat data base of companies, were sent a three page questionnaire in March 1992. Questions covered the nature and scale of the company's advertising, the nature of competition as well as conjectural questions asking about firms' strategic responses to various scenarios. This produced 6 responses and resulted in minor changes to the questionnaire being made. A copy of the final questionnaire is provided in Appendix 2.

In the last two weeks of May 1992, a further 1307 companies were sent the revised questionnaire, making a total of 1332 in all.[11] Letters were addressed to "The Advertising Manager" and the firm was asked to send back the form if they "felt unable to take part in the survey". In addition, firms were assured that responses would be kept strictly confidential. Questionnaires were marked with an exclusive code matching each firm and in virtually no cases did a responding firm make an attempt to erase this code[12].

Useful replies were received from a further 178 companies. One hundred and six

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[11]These companies comprised all those on the Microexstat database for which current addresses were held.

[12]In the very few cases where this did occur, the firm was identifiable from the envelope.

companies either returned uncompleted questionnaires, or sent a letter explaining why they had not taken part in the survey. In addition, 20 questionnaires were returned with an indication that the company was no longer operating. Excluding these 20 companies, the useful response rate was 13.8%.

In the first two weeks of July, a follow up letter, together with another copy of the questionnaire, was sent to the 1024 firms who had not yet responded.

This second mailing produced 141 valid responses, together with 84 uncompleted forms or letters of explanation. A further 14 forms were returned due to the company no longer operating. Excluding these 14, the useful response rate was 14%.

Excluding the 34 companies known no longer to be operating, 325 useful replies were received out of a total of 1298 companies surveyed. The overall response rate then is 25%.

Including those not wishing to take part in the survey, there were 515 responses of any sort - 39.7% of the firms surveyed. A summary of the reasons which firms gave for not taking part is presented in Appendix 3.

3.2.2 Response By Industry Sector

Questionnaire response by industry group is given in Table 3.1. Companies are divided into those whose main areas of production are found within the following categories: Producer (capital) Goods, Consumer Goods, Utilities, Financial Services

and Others. In this the Microexstat classifications are generally used. However some companies (classified under the Microexstat "Other Groups") were re-allocated into another group when their questionnaire response clearly indicated that it was appropriate. In addition water companies listed under Microexstat Group 9 are classified as Utilities. Consumer Goods industries are further divided into Durables and Non-durables. Lastly Retailers are distinguished as another consumer sub-group.

Consumer and producer goods industries are fairly equally represented, with about 40% of the sample in each category. The consumer section is dominated by firms producing non-durables, of which there are 100, as compared to 25 durable goods firms. Completed forms were received from 19 firms classified as retailers, all from within the non-durables group.

A more detailed breakdown of the sample by industry, across both the Microexstat industry groupings and the SIC two-digit industry classifications is given in Appendix 3.

Additional data on sales, turnover, assets, age of company and so on were collected for the responding firms using the Microexstat and FAME databases. Table 3.2 shows the distribution of firm size as classified by 1992 fixed tangible assets for the 307 firms for whom data is held. Respondents cover a wide range of companies from the medium sized, with assets below £1 million, up to the very large with assets over £5 billion.

3.2.3 Sample Selection Tests

In order to investigate the possible problems of sample selection bias, several tests are carried out. The industry sector classification for non-respondents is given in Table 3.1. A chi-square test is used on the null hypothesis that the distribution of firms across producer, consumer and finance sectors is same for both respondents and non-respondents (including those returning uncompleted forms). The $\chi^2(2)$ statistic works out as 6.85 which is significant at the 5% (but not 1%) level. When the consumer sector firms are split into durables and non-durables, the $\chi^2(3)$ is 7.60 which is significant only at the 10% level. Thus there is weak evidence of selection bias. Namely, slightly more producer firms and slightly fewer consumer firms responded than would be expected from the whole sample.

The second set of tests compare the mean sales, fixed tangible assets and pre-tax profits in 1992 of the respondents and non-respondents. Of the latter, data is held for all three variables for 890 firms, whilst data is available for 303 of the responding firms. The means and standard deviations are reported in Table 3.3. A simple t-test of the difference in means cannot reject the null hypothesis that there is no difference at even the 10% level of significance in any of the three cases.

The sample seems to be quite representative of all firms who were sent questionnaires in terms of size, turnover and profits. The only cause for concern is the suggestion that slightly more firms operating in producer goods markets responded.

3.3 QUESTIONNAIRE RESPONSES

3.3.1 Which Firms Advertise and Which Do Not?

Basic advertising theory suggests several broad generalisations about which sort of firms are likely to advertise more. One is that producer goods will tend to be advertised less than consumer goods. Companies are seen as having more information about products they buy than consumers. Also they may have more of an incentive to check up on a good's attributes rather than relying on advertising. Nick Kamen may be perfectly capable of persuading a teenager to buy a pair of Levi Jeans. It may take more than a thirty second advertisement to persuade the production manager at Levi to buy a £100,000 piece of sewing machinery.

In the terminology of Search Theory (Stigler, 1961), the marginal benefit of searching amongst different manufacturers is greater for the producer than for the consumer. Assuming similar costs of search for both, producer goods will have a higher optimal level of search. When purchasers undertake more search, the role for advertising is diminished.

The argument can also be worked in terms of the Dorfman-Steiner elasticities approach. In their most basic result, the optimal advertising to sales ratio is equal to the ratio of advertising elasticity of demand to price elasticity of demand[13]. If consumer goods are more responsive to advertising (or less responsive to price changes), then a higher optimal level of advertising results.

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[13]See Chapter 4 for a proof and discussion of this result.

The same logic applies in the case of non-durable versus durable goods. By definition the latter are not subject to so many repeat purchases. They are also likely to be more expensive, causing the consumer to take care that the most suitable and economic product is being purchased. Thus the marginal benefit of search for consumers is greater when considering buying a new bathroom suite than for a Mars Bar. Consequently advertising is more worthwhile in the latter case.

The first question on the survey asked simply:

"Does your firm advertise?"

No definition of advertising was given, leaving it open to managers to decide what constitutes advertising for their firms. Seventy eight (24%) said they did not advertise at all. This figure corresponds very closely to the 22% non-advertisers reported by Robinson and Chang (1996) in the US. The breakdown by industry type is shown in Table 3.4 along with the 244 firms who stated that they did advertise.

Perhaps surprisingly, in the light of advertising theory, about the same proportion of companies (20%) in each of the producer, durables and non-durables categories do not advertise. The solution may be that whilst advertising as persuasion is more worthwhile in non-durable industries, advertising which provides factual information is useful in reducing search costs in all industries. Some sectors (e.g. non-durables) may advertise more than others, but at least some minimum level of advertising is equally useful in all sectors. This issue is explored in more detail in Chapter Four.

3.3.2 Advertising Levels

Measurement Problems

There has been a good deal of controversy over how the level of advertising should be measured. Information on three measures - advertising to sales ratio (A/S), total advertising (A) and numbers of people working in the advertising department (People) - is asked for in the survey. It is useful to review briefly the rationale behind them.

The most obvious, and most common, measure is the ratio of advertising expenditure to total sales (A/S). There are several quite severe problems in using this to make comparisons between firms.

First there is the general problem of using advertising expenditure as a measure of messages received by consumers. Quality may vary quite widely between the medium used and between advertisers. However, it is reasonable to assume that good quality is reflected by higher costs, at least on average.

Rather more worrying is the way in which the same money may reach different numbers of customers. Take, for example, two firms: one with a specialist product aimed at a select, but geographically diffuse, group of consumers and, secondly, a larger firm with a much bigger customer base. To reach all their customers it may be necessary for both firms to spend equal amounts on advertising, particularly if that advertising is open to everyone such as TV, posters or radio. The first firm would have a larger value of A/S than the second, even though advertising is equally

intensive in terms of messages received by customers[14].

The possibility that larger firms may achieve pecuniary economies of scale in advertising has been widely discussed in advertising literature. If they do exist, then larger firms would need to spend proportionately less on advertising to achieve the same intensity. One possibility is that large advertisers achieve preferential rates, although Schmalensee (1972) suggests there is little hard evidence for this. Perhaps more likely, according to Blair (1972), is that larger advertisers get preferential times and access, for example, to the best poster spaces.

Evidence for technical economies of scale is more forthcoming. Albion and Farris (1981), amongst others, discuss the "threshold effect", whereby some minimum number of messages need to be received before any effect is felt. This implies that the average cost of advertising at lower levels is extremely high. Clearly, larger firms will be able to spread overhead costs and to run specialist advertising departments or to employ cost efficient agencies. Another example, discussed in Brown (1978) and Peles (1971), is where the optimal medium (such as TV) requires a big initial outlay. Evidence of decreasing returns (see Thomas, 1989) after the threshold point suggests that, at some point, diseconomies of scale will set in.

In general, the cost of achieving the same proportional effect will be lower the higher

[14]An additional (statistical) point is that, other things being equal, sales will be higher the further along the chain of production is the firm. This may cause a downward bias to A/S for retail and consumer orientated firms. An alternative measure of advertising intensity is advertising weighted by value added.

the level of advertising. Advertising per unit of sales will not adequately reflect the amount of advertising being undertaken. Using A/S will therefore underestimate the relative advertising intensity for larger firms. Taking one example from the survey, the two smallest breweries who responded stated that their advertising ratio was 5.3% and 4.5% respectively, nearly three times the industry mean of 1.8%. Although it is possible that consumers do receive a relatively high barrage of advertising from these two companies, there is no a priori reason to believe this to be so. Another example is that of petroleum for which the mean advertising intensity is 0.2% (disregarding the non-advertisers). This is about one tenth of the mean for all firms, yet casual observation suggests that petrol is fairly heavily advertised. This is reinforced by the mean level of total advertising expenditure for the oil companies of £7.7 million per year, over three times the mean for all firms (see Table 3.5a).

The last problem is that of differing product cost. Take, for example, a car manufacturer and a toothbrush manufacturer both with exactly the same target group of customers. Both firms manage to reach each of their customers with an advertisement. The customers receive an equal level of advertising from each company but clearly the car manufacturer will have an advertising to sales ratio many times lower than the toothbrush company, simply because cars are that much more expensive. To get around this, an ideal measure would be advertising per unit sold or advertising per potential customer. Such a measure presents obvious problems in terms of data collection (the reason why A/S is so widely used). However, the problems associated with A/S are of sufficient significance to merit considering the use of absolute measures of advertising.

Two such measures are "People" - the number of people working in the advertising department and "A" - total advertising expenditure. An absolute measure faces its own set of problems, most obviously that it will overestimate the advertising intensity of larger firms. Ultimately some weighted average of the A and A/S may be most satisfactory.

Survey Evidence

Table 3.5a shows (for the advertisers only) means for A/S, A and P for each industry type, together with the number of firms (n) who gave relevant information for each measure.

Taking A/S first, firms were asked:

> "How much do you currently spend on advertising as a percentage of your sales?"

They were provided with a choice of giving a precise figure or ticking one of 11 ranges. Of the advertisers, 222 firms provided an answer. The majority of firms (123) say they spend less than 1% of their sales. A further 66 spend between 1 and 5%, leaving 33 spending more than 5% on advertising. The highest figure was 15% and the mean is 1.80%. Including the non-advertisers, and taking the mid-point of each range, the mean A/S for all firms in the sample is 1.46%.

There is clearly initial support for the predictions outlined in section 3.1. Taken as a

whole, the mean for firms in consumer industries is significantly higher than that for producer industries. Within the consumer sector, firms producing non-durables spend about 50% more on advertising than those in durable industries, and the highest level of all is in the retail sector.

The two other measures support this view. One hundred and six firms provided a figure for total advertising spending in 1991. By far the biggest advertisers are the consumer non-durable firms, who spent a mean of £3.2 million in 1991, some 13 times higher than producer industry firms.
211 firms answered the following question:

"About how many people work in your advertising department?"

The fact that many firms use an external advertising agency is an obvious problem with this question. Thus all those answering "none" are excluded from Table 3.5a. This bias, and the difficulty for many smaller firms in estimating the amount of time spent on advertising, mean that "People" is the least preferred measure of advertising levels. Even so, a similar pattern to both the other measures is revealed.

It has also been suggested that the level of advertising may be determined by the rate at which new products are introduced. Lambin (1976) and Backman (1967) reason that advertising tends to be concentrated at an early stage of a product's life as it is more difficult to build up a stock of goodwill in a product than it is to maintain that goodwill. Thus a high turnover of brands, as in drugs, cereals, ice creams, will lead

to a high level of advertising. For this reason firms were asked:

"How many new products have you introduced since 1985?"

Answers to this question are included in Table 3.5, under the New Products column. There is a significantly higher turnover for consumer goods, most pronounced for durable goods firms.

Table 3.5b shows the simple correlations between A/S and the other three measures for the whole sample and also for the producer and consumer sub-samples. There is a fairly high, positive correlation between A/S and A, especially for consumer firms. The correlation is only weakly positive between A/S and People, whilst the correlation with new products is negative (but very weak) even within consumer industries. The reasons behind differing levels of advertising intensity are investigated in Chapter Four.

3.3.3 Trends in Advertising

Table 3.6 summarises information on changes to advertising between 1980 and 1985 and from 1985 to the survey date. Firms were asked:

"Allowing for inflation, how has the amount you spend on advertising changed since 1985? ... from 1980-1985?"

On reflection it would have been more interesting to have used two time periods that

correspond more closely to the economy wide boom of the mid to late eighties and the subsequent recession. However the information obtained is still useful for controlling for dynamics in the firms' advertising decisions.

As might be expected, significantly more firms decreased their advertising since 1985 than between 1980 and 1985. One other interesting point is that over half of consumer firms increased their advertising in the later period compared to under 40% of producer firms. In the earlier period the proportions were both nearly two thirds. This may indicate the willingness of firms in consumer industries to use advertising as a competitive weapon to try and buck the trend of recession, a view supported in Section 3.3.6 below.

3.3.4 Price Information in Advertisements

As we have seen, the welfare implications of advertising may depend on whether useful information is provided. A key piece of information which firms may include is the price of the product. With this in mind, firms were asked:

> "About what percentage of your advertisements provide specific information about the price of your product (s)? 0%; 0-10%, 10-50%, 50-75%, 75-100%"

Answers are condensed into three categories: "none" (0 or 0-10), "some" (10-50 or 50-75) and "nearly all" (75-100). Table 3.7 summarises this information, again by type of industry. This may be particularly relevant to the 'information versus

persuasion' debate. If prices are being advertised then at least some relevant information is being disseminated. The costs of comparing prices between companies are reduced and thus demand may become more price elastic.

For the vast majority of firms (76%), none, or virtually none, of their advertisements carry information on prices. This is fairly consistent throughout the industry sectors. The one exception, though from a relatively small sample of 16, is retailing in which the majority of firms say that some or all of their advertisements have price information. This is in line with both common sense and everyday observation - note, for example, the special offers advertised every week in local papers by major supermarket chains. Chapter Seven takes a closer look at the implications and determinants of price advertising.

3.3.5 Different Advertising Media

Some work (e.g. Becker and Murphy, 1993; Wright, 1994) has suggested that welfare effects of advertising may vary across different media. Question 8 asked firms to rank advertising media in order of how much is spent on each and responses are summarised in Table 3.8. The dominant medium for producer firms is the trade press. Across all firms, most money is spent on either national or local press. A significant minority of firms (mainly based in consumer industries) rank television as the most important medium.

3.3.6 Strategic Advertising

Recent literature on advertising has begun to move away from the emphasis on

advertising/profitability and advertising/concentration issues. Now, more attention is being paid to advertising as a strategic weapon. For example, Gasmi et al (1990) discuss the testing of collusive behaviour in oligopoly using advertising and price as the strategic variables. Other examples include Roberts and Samuelson (1988) and Slade (1995). Several questions in this survey relate to strategic issues and some useful data has been collected.

Advertising as a Competitive Weapon

Question 10 asked firms to rank various modes of competition on a scale of 1 to 6. Table 3.9a summarises information on the top three rankings only, a place in the top three being taken as implying the mode is seen as important.

Firms perceive the dominant mode of competition to be the quality of their products. This may not be surprising - how many managers will not believe (or at least say they believe) their goods to be of high quality? Price is seen as the second most important although, interestingly, 70 firms (27% of the total answering the question) do not mention price at all in the top three.

A significant minority (25%) of firms say that advertising is an important method of competition. A further 139 firms (53%) include sales effort in the top three. As the distinction between advertising and sales effort is not always obvious, both of these forms of competition are considered by industry type in Table 3.9b.

Advertising as a mode of competition stands out in consumption industries where it is

cited by 41% of firms compared to 25% of firms in all sectors. Within the consumption industries, it is cited least by durables firms. This all seems to confirm the above view that advertising is more likely to be used in a strategic or competitive (as opposed to informative) manner in consumer industries and particularly in the non-durable sector.

Responses to the Business Cycle

Firms were asked:

> "Would a recession cause you to increase, decrease or not change your level of advertising?"

and

> "Would a boom cause you to increase, decrease or not change your level of advertising?"

Results are summarised in Tables 3.10a and 3.10b.

The dominant responses are either to leave advertising unchanged or to act pro-cyclically, that is, decreasing in a recession and increasing in a boom. This latter response may simply be evidence of a set advertising to sales ratio, where the company is responding to business conditions in a passive manner. However there is a marked asymmetry - significantly fewer firms decrease their advertising in a recession than increase it in a boom (37% compared to 46%). This would seem to indicate that a significant minority of firms do use advertising pro-actively in response to business conditions (and to recessions in particular). This is much more

pronounced in the "non-durables" sector where over a fifth of firms say they would actually increase their advertising in a recession.

Interactions with Rival Firms

Question 11 asked for four pieces of information about rivals and rival reactions. Question 11a asked for information on the perceived number of competitors:

> "How many other firms compete with you in your market(s)? 0-5; 5-10; over 10"

Two hundred and seventy firms gave an answer (summarised in Table 3.11a) and these responses may be seen as a crude measure of market concentration. The problems with any concentration measure are well known (see Auerbach, 1988, chapter 3 for a critical review). By using the managers' opinion of the number of competitors, certain practical problems are avoided. For example, there is no need for researchers to place a firm within a definite, and sometimes arbitrary, geographical or product area. Similarly, Robinson and Chang (1996) argue that their use of PIMS (Profit Impact of Market Strategies) survey data is preferable as "because managers define the market boundaries...they should be more accurate than those based on SIC codes" (p.393).

The main drawback with the measure obtained from the questionnaire is that there are only three possible levels. Chapter Four provides a comparison of the impact of this survey measure with that of more traditional concentration measures. estimates of

which are obtained for manufacturing industries from the Census of Production.

Question 11b asked for information on the distribution of advertising within the firm's market:

> "Does one firm dominate advertising in your market, a few firms or do all firms advertise more or less equally?"

As Table 3.11b shows, the majority of respondents state that a few firms dominate advertising, and the proportion is similar across producer and consumer firms. In only 11% of cases do firms indicate that one firm dominates.

The question of how changes in one firm's advertising will affect others has had little coverage in empirical papers. One exception is Roberts and Samuelson (1988) whose empirical results on the US cigarette industry "suggest that firms act as if their advertising choices will alter the future advertising choices of rival firms..." (p.200).

Questions 11c and 11d asked the following:

> "If competitors decreased their advertising would it cause you to increase your advertising, decrease it or leave it unchanged?"
> "If competitors increased their advertising would it cause you to increase your advertising, decrease it or leave it unchanged?"

Responses to these two questions are summarised by industry in Tables 3.11c and 3.11d respectively.

Many more firms say they would react to a rival increasing advertising than to a rival who decreases advertising, with the phenomenon being more pronounced amongst consumer industry firms. The nature of this asymmetric response is not dissimilar to kinked demand curve strategies found in oligopoly theory. This question and the response to different business conditions are analyzed in more detail in Chapter Eight.

3.4 CONCLUSIONS

A large amount of data on advertising have been collected from firms across all sectors of the economy and a wide range of firm sizes. There is weak evidence that the sample is biased towards firms mainly based in producer, as opposed to consumer, goods industries. Apart from that, the data are robust to charges of sample selection bias.

Initial analysis suggests some support for traditional advertising theory, in particular that advertising intensity is higher within certain sectors. By any measure, advertising is significantly more intensive in consumer industries in general and in the non-durable sector in particular. Retailing also stands out as having an exceptionally high level of advertising.

There is consistent evidence on the use of advertisements as a strategic tool in a significant minority of firms, again concentrated in consumer goods industries. If

such strategic use of advertising indicates that firms are not using it in purely passive way to get information over, this may be seen as shedding some light on the information versus persuasion debate.

The following chapters of the thesis analyze the information gathered in some detail using more sophisticated statistical techniques.

Table 3.1: Respondents by Industry Type

	Non-Respondents	%	Non-Completed	%	Completed	%
Producer	250	32	66	35	138	42
Consumer	366	47	69	36	131	40
Durables	79	10	9	5	31	10
Non-durables	287	37	60	31	100	31
Retail	-	-	20	11	19	6
Financial	41	5	9	5	19	6
Utilities	5	1	3	2	6	2
Others	121	15	43	23	31	10
Total	783	100	190	100	325	100

Table 3.2: Size Distribution of Respondents

Fixed Tangible Assets (£m 1992)	Number of Firms
< 1	22
< 5	41
< 10	50
< 100	122
< 500	48
< 1000	9
< 5000	11
< 5000 +	4
Total	307

Table 3.3: Comparison of Respondents and Non-respondents

Variable	Respondents		Non-Respondents		
	Mean	Std Dev	Mean	Std Dev	t-stat
Sales	508.0	2212.3	415.3	1206.3	0.91
Pre-tax Profits	20.4	93.3	23.5	141.5	0.35
Fixed Tangible Assets	337.7	1935.1	198.5	1094.4	1.54
N	303		890		

Note:
The t-statistic is based on the null hypothesis that the sample means are equal.

Table 3.4: Advertising and Non-advertisers by Industry Type

	Non-Advertisers	%	Advertisers	%
Producer	26	19	112	81
Consumer	22	17	109	83
Durables	3	10	28	90
Non-durables	19	19	81	81
Retail	3	16	16	84
Financial	8	42	11	58
Utilities	1	17	5	83
Others	15	48	16	52
Total	72	22	253	78

Note:
% represents the percentage of firms in each sector who state that they do not advertise and do advertise respectively.

Table 3.5a: Mean Level of Advertising: various measures

	A/S %	N	A (£000)	N	People	N	New Products	N
Producer	1.12	103	248	52	3.4	67	54	80
Consumer	2.58	99	2669	43	4.5	77	76	76
Durables	1.89	28	782	10	3.7	18	159	23
Non-durables	2.57	71	3241	33	4.7	59	53	53
Retail	3.67	15	3020	9	5.3	14	78	8
Financial	1.28	9	335	3	3.9	7	7	5
Utilities	3.26	4	140	2	7.5	2	3	3
Others	1.98	13	4631	6	4.8	6	13	9
Total	1.80	230	1478	106	4.0	159	65	186

Notes:
1. N = the number of advertisers replying to each question.
2. People excludes responses indicating zero - see text for details.
3. Figures exclude non-advertisers.

Table 3.5b: Correlation Between Advertising Measures

	Correlation between A/S and:					
	A	**N**	**People**	**N**	**New Products**	**N**
Producer	0.330	54	0.070	88	-0.007	84
Consumer	0.380	41	0.010	89	-0.084	78
Total	0.247	106	0.183	202	-0.021	179

Table 3.6: Advertising Trends by Industry Type

	1985 - 1991			1980 - 1985		
	Inc	Dec	No Ch	Inc	Dec	No Ch
Producer	41	32	27	52	9	21
Consumer	50	27	19	56	7	21
Durables	10	12	3	16	3	3
Nondurable	40	15	16	40	4	18
Retail	9	4	3	9	1	4
Financial	4	2	5	6	0	3
Utilities	4	0	1	2	1	0
Others	5	4	4	8	2	2
Total	104	66	56	124	19	47

Table 3.7: Percentage of Advertisements Containing Price Information

	None	%	Some	%	All	%	Total (100%)
Producer	90	87	6	6	8	8	104
Consumer	69	68	14	14	18	18	101
Durables	18	167	4	15	5	19	27
Non-durables	51	69	10	14	13	18	74
Retail	6	38	3	19	7	44	16
Financial	9	82	0	0	2	18	11
Utilities	1	25	2	50	1	25	4
Others	9	69	3	23	1	8	13
Total	178	76	25	11	30	13	233

Note:
See text for definition of the None, Some and All categories.

Table 3.8: Number of Firms Ranking Advertising Media 1, 2 or 3.

Medium	Rank 1	Rank 2	Rank 3
TV	32	8	8
Radio	4	9	13
Poster	7	19	25
Transport	0	5	8
Cinema	0	0	4
National Press	47	45	20
Local Press	32	47	34
Trade Press	108	30	10
Direct Mail	10	9	4
Directories	8	7	6
Total	248	180	132

Table 3.9a: Number of Firms Ranking Mode of Competition 1, 2 or 3

Form of Competition	Rank 1	Rank 2	Rank 3	Total
Price	70	72	48	190
Quality	136	70	24	230
Sales Effort	21	49	69	139
Advertising	12	17	35	64
After Sales Service	7	37	55	99
Others	14	12	13	39
Total	260	257	244	-

Table 3.9b: Advertising and Sales Effort as a Competitive Tool

	Adverts	%	Sales Effort	%	Total (100%)
Producer	12	10	65	56	116
Consumer	46	41	60	54	112
Durables	11	39	10	36	28
Non-durables	35	42	50	60	84
Retail	9	53	10	59	17
Financial	2	17	6	50	12
Utilities	1	20	1	20	5
Others	3	19	7	44	16
Total	64	25	139	53	259

Notes:
1. Total = number of firms replying to question 10.
2. % is the percentage of all firms in that category ranking that form of competition 1, 2 or 3.

Table 3.10a: Advertising Response to a Recession

	Increase	%	Decrease	%	No Change	%	Total (100%)
Producer	15	13	45	40	53	47	113
Consumer	16	15	39	36	53	49	108
Durables	1	4	17	61	10	36	28
Non-durables	15	19	22	28	43	54	80
Retail	3	19	4	25	9	56	16
Financial	1	7	5	33	9	60	15
Utilities	1	20	0	0	4	80	5
Others	1	5	6	32	12	63	19
Total	34	13	95	37	131	50	260

Table 3.10b: Advertising Response to a Boom

	Increase	%	Decrease	%	No Change	%	Total (100%)
Producer	46	41	6	5	61	54	113
Consumer	53	50	5	5	48	45	106
Durables	20	20	0	0	8	29	28
Non-durables	33	33	5	6	40	51	78
Retail	5	31	2	13	9	56	16
Financial	5	33	1	7	9	60	15
Utilities	1	20	0	0	4	80	5
Others	12	63	1	5	6	32	19
Total	117	45	13	5	128	50	258

Table 3.11a: Number of Competitors Faced by Firms

	0-5	%	5-10	%	Over 10	%	Total (100%)
Producer	22	19	19	16	77	65	118
Consumer	18	16	22	19	74	66	116
Durables	5	17	7	23	18	60	30
Non-durables	13	15	15	17	58	67	86
Retail	1	6	4	24	12	71	17
Financial	1	8	2	15	10	77	13
Utilities	4	67	0	0	1	17	6
Others	1	6	2	4	15	83	18
Total	46	17	45	17	179	66	270

Table 3.11b: Number of Firms Dominating Advertising

	1 Firm	%	A Few Firms	%	All Firms	%	Total (100%)
Producer	10	9	63	57	37	34	118
Consumer	16	14	68	61	27	24	116
Durables	3	10	17	59	9	31	30
Non-durables	13	16	51	62	18	22	86
Retail	3	18	11	65	3	18	17
Financial	0	0	5	45	6	55	13
Utilities	1	25	1	25	2	50	6
Others	1	7	4	27	10	67	18
Total	28	11	141	56	82	33	270

Table 3.11c: Advertising Response if Competitors Decrease Advertising

	Increase	%	Decrease	%	No Change	%	Total (100%)
Producer	6	5	2	2	105	93	113
Consumer	4	4	2	2	106	95	112
Durables	2	2	2	7	23	87	30
Non-durables	2	2	0	0	80	98	82
Retail	1	1	0	0	15	94	16
Financial	0	0	0	0	11	100	11
Utilities	0	0	1	20	4	80	5
Others	0	0	1	6	15	94	16
Total	10	4	6	2	241	94	257

Table 3.11d: Advertising Response if Competitors Increase Advertising

	Increase	%	Decrease	%	No Change	%	Total (100%)
Producer	24	21	1	1	87	78	112
Consumer	34	31	1	2	76	68	111
Durables	10	33	1	3	19	63	30
Non-durables	24	30	0	0	57	70	81
Retail	3	19	1	6	12	75	16
Financial	2	18	0	0	9	82	11
Utilities	1	20	0	0	4	80	5
Others	7	44	0	0	9	56	16
Total	68	27	2	1	185	73	255

Chapter 4

EXPLAINING ADVERTISING INTENSITIES: an alternative approach based on survey data

4.1 INTRODUCTION

The question of why some firms or industries advertise more than others has produced a wealth of empirical studies. These have tended to take one of two approaches: attempts to find variables which can explain differences in advertising and investigations into the relationship between advertising and concentration. Work in the latter category has tended to use industry level data.

This chapter aims to do two things. Firstly, to examine the decision by firms whether or not to advertise at all and, secondly, to explore the determinants of advertising intensity at the firm level. Rather than using traditional measures of market structure, survey data is used to provide information on the nature of the market as perceived by the company. As has been discussed previously, there are both disadvantages and advantages in the use of such data. The results of this chapter indicate that this approach offers great potential in exploring the advertising-market structure relationship.

Following these opening remarks, the next section of the chapter discusses several methodological issues. In Section 4.3, some theoretical considerations are outlined whilst the following two sections introduce the relevant survey data and discuss the empirical results. Section 4.6 contains some concluding remarks.

4.2 METHODOLOGICAL ISSUES

Several methodological problems immediately present themselves when investigating advertising levels and are discussed in turn in the following sections. The first is the treatment of non-advertisers. Secondly, there is the question of cross-section versus times series data. A third problem is the level of aggregation to be used and lastly there is the choice of dependent variable.

4.2.1 Treatment of Non-advertisers

Advertising intensity is a truncated variable with zero as its lower limit. As a result, Tobit estimation may be appropriate. In practice data availability at the firm level has generally restricted empirical work to those firms who actually advertise[15]. It is possible however that factors influencing the decision to advertise may be quite different to those about how much to advertise. For example, as discussed in Chapter Two, firms may face some sort of "threshold effect" which makes it not worthwhile for a small company to advertise at all, irrespective of market structure or the nature of its product. However, once over a certain size, the intensity of its advertising may depend very much on market structure or the proportion of output going to final consumers. The majority of the information gained from the survey is restricted to firms who advertise. However, some information is held for (self-defined) non-advertisers, enabling the advertising decision to be treated separately in the empirical sections of this chapter.

[15]One exception is the PIMS (Profit Impact of Market Strategies) data in the US. As with this study, the PIMS data is based on firms volunteering information.

It should be noted that any regression which ignores non-advertisers is likely to suffer from specification bias. One approach which seeks to get around this problem involves the use of the Heckman Selection Estimator (see Greene, 1996 pp. 711-3). However, this requires that there are variables in the advertising decision equation which do not enter into the advertising intensity equation. It is not clear that such variables exist in this context and, thus, the two equations are treated separately here (as in virtually all other work on advertising intensity).

4.2.2 Cross-section versus Panel Data

The majority of early studies on advertising levels attempted to explain cross-sectional differences across firms or industries rather than over time. Some work has tried to control for changes over time either by using averages over several years (Farris and Buzzell, 1979) or by incorporating dynamic effects of advertising (e.g. Cable, 1972). More recently, the use of panel data has been employed (Balasubramanian and Kumar, 1990; Ailawadi, Farris and Parry, 1994). Data limitations (see below) restrict the scope of studies such as this. In any case, although the panel data approach is intuitively appealing, Ailawadi et al (1994) suggest that, at the firm level, little is gained in terms of explanatory power by the use of time series data. A likely reason for this is the lack of within-firm variation over time.[16]

4.2.3 Level of Aggregation

[16]An illustration of this can be seen in the restricted sample of 109 firms for which more than one year of total advertising data is held. The total variance of advertising across all years is about 30.6. Of this, 29.38 (or about 96%) is between firm variation and only 1.12 is within firm variation.

Variations in advertising intensity can be considered across several levels of aggregation. Most common have been industry level (either 3- or 4-digit SIC industries) studies such as Cable (1972), Comanor and Wilson (1974), Buxton, Davies and Lyons (1984), Uri (1987) and, more recently, Gisser (1991). Firm or Strategic Business Unit studies include Farris and Buzzell (1979) and Balasubramanian and Kumar (1990). The most disaggregated studies (e.g. Lilien and Weinstein, 1984; Reekie, 1975) have looked at differences across brands or products.

Work on the advertising-concentration relationship has been almost exclusively based on industry level data (one UK exception being Reekie, 1975). Indeed UK empirical research into advertising at the firm level is virtually non-existent. The main reason for this is the difficulty in obtaining reliable data on advertising by firms in the UK. Survey data is one of the few ways of obtaining company advertising information. Thus, the database on which this chapter is based provides a unique insight into advertising by UK companies.

4.2.4 Choice of Dependent Variable

The dependent variable studied has generally been some variant of the advertising to sales ratio (or advertising intensity). One exception is Lilien and Weinstein (1984) which uses absolute levels of advertising and marketing. A theoretical basis for the use of advertising intensity comes from the classic Dorfman-Steiner (1954) result relating optimal levels of advertising intensity to own-price and advertising elasticities of demand.

There are reasons to believe that advertising intensity imposes unrealistic restrictions on the model. Notably, in the presence of economies of scale in advertising, advertising input (i.e. spending) will underestimate advertising output (messages received) for larger advertisers. The extent of advertising economies is a matter of some debate (see, for example, Schmalensee, 1972; Albion and Farris, 1981). There seems little sense, however, in a model excluding the possibility of their existence a priori.

There may be a similar downward bias to advertising intensity for firms selling products with a very high unit cost. If two firms have a similar number of potential customers the same amount of money may need to be spent on advertising by each firm to reach all their customers. The one selling the product with a high unit cost will have a lower advertising to sales ratio even though the advertising intensity received by customers is the same for both firms.

These considerations indicate that when advertising intensity is used as the dependent variable, some measure of firm size (such as sales itself) is included as an independent variable. If economies of scale are present, it is expected that higher sales will be associated with a lower advertising to sales ratio.

4.3 THEORETICAL CONSIDERATIONS: advertising and market structure

Using a very standard approach, a relationship between market structure (in terms of the price-cost markup) and advertising intensity can be derived following Dorfman-Steiner (1954).

The profit function for a profit maximising monopolist is given as follows:

$$\pi = p.q(a,p) - C[q(a,p)] - a.t \tag{4.1}$$

where $\partial q/\partial a > 0$, $\partial q/\partial p < 0$

and π = profits; p = price; C = total costs; a = number of advertising messages; t = cost per advertising message.

Differentiating with respect to price gives:

$$\frac{\partial \pi}{\partial p} = q + p.\frac{\partial q}{\partial p} - \frac{\partial C}{\partial q}.\frac{\partial q}{\partial p} = 0$$

$$\frac{q}{p}.\frac{\partial p}{\partial q} + 1 - \frac{\partial p}{\partial q}.\frac{1}{p}.\frac{\partial C}{\partial q} = 0$$

$$1 - \frac{\partial C}{\partial q}.\frac{1}{p} = -\frac{q}{p}.\frac{\partial p}{\partial q}$$

$$\frac{(p - \frac{\partial C}{\partial q})}{p} = -\frac{q}{p}.\frac{\partial p}{\partial q}$$

$$\frac{(p-mc)}{p} = \frac{1}{PED} \tag{4.2}$$

where mc = marginal cost (= $\partial C/\partial q$) and PED is the price elasticity of demand.

Equation (4.2) is the Lerner Condition of monopoly power (Lerner, 1934).

Differentiating (4.1) with respect to advertising gives:

$$\frac{\partial \pi}{\partial a} = p.\frac{\partial q}{\partial a} + \frac{\partial p}{\partial a}.q - \frac{\partial C}{\partial q}.\frac{\partial q}{\partial a} - t = 0$$

$$\frac{\partial q}{\partial a}.(p - \frac{\partial C}{\partial q}) = t$$

$$\frac{a}{q}.\frac{\partial q}{\partial a}.(\frac{p - mc}{p}) = \frac{a.t}{p.q}$$

$$\frac{a}{p.q}.\frac{\partial q}{\partial a}.(p - \frac{\partial C}{\partial q}) = \frac{a.t}{p.q}$$

$$AED(\frac{p - mc}{p}) = \frac{A}{S} \qquad (4.3)$$

where AED is the elasticity of demand with respect to advertising and A/S is the proportion of sales revenue spent on advertising (or advertising intensity).

Combining (4.2) and (4.3) gives an alternative formulation of the Dorfman-Steiner hypothesis:

$$\frac{A}{S} = \frac{AED}{PED} \qquad (4.4)$$

Equation (4.3) predicts that firms with higher price-cost markups will advertise more heavily. This hypothesis is supported by previous studies such as Ailawadi et al (1994), Buxton et al (1984) and Farris and Albion (1981)[17]. From equation (4.4), we would expect firms who sell goods which are more responsive to advertising and less responsive to price advertising to advertise more heavily. Apart from market structure, factors which may effect either AED or PED include the extent to which

[17]The correlation between profits and advertising is explored in greater depth in Chapter Five.

the firm operates in consumer markets, whether the good touches a sensitive nerve with consumers, the stage of the product life cycle and so on.

4.3.1 The Inverse U-curve

The original Dorfman-Steiner hypothesis left two factors unconsidered. The first is the dynamic nature of advertising, an issue treated in Arrow and Nerlove (1962) and in many subsequent game theoretic papers such as Friedman (1983) and Stahl (1994). The second is the question of interactions between firms. Equation (4.3) suggests that advertising will be at its most intense under conditions of monopoly (or colluding oligopolists) when the price-cost markup is at its highest. Anecdotal evidence, however, suggests that the highest levels of advertising occur when very few rivals are competing with each other.

It is also possible to derive theoretical support for the idea that advertising peaks at some critical level of concentration (the inverse U-curve relationship). Advertising by a firm has two different effects. Firstly it may increase the market share of that firm. Secondly, it may increase the size of the whole market, to the benefit of all firms. Thus, some of the benefits of advertising by a company will be captured as external benefits by rival firms.

At extremely low levels of concentration, corresponding to perfect competition, firms are price takers. Everything can be sold at the market price, so no advertising is necessary. In addition, virtually the whole of the market size effect is appropriated by other firms, reducing the incentive of firms to advertise.

As the number of rivals decreases, advertising by one firm captures a greater proportion of the market size effect and has a more noticeable effect on market share. Firms begin to be aware of, and react to, changes in advertising by rivals. Thus, as rivals become more aware of each other, we can expect advertising to increase. The extent to which it increases depends on the nature of the reaction between firms.

If firms collude over advertising, then advertising intensity will tend towards the joint profit maximising level suggested by Dorfman-Steiner (though still greater than competitive levels). If firms act aggressively over advertising, then advertising may exceed joint profit maximising levels.

Much of the empirical work on advertising intensity has concentrated on the existence of the inverse U-curve relationship between advertising and concentration as measured by the Herfindahl Index or a concentration ratio. The peak of the inverse U-curve is the point at which firms begin to collude over advertising, subsequently reducing its intensity.

Support for this relationship has been found in studies such as Cable (1972), Sutton (1974), Strickland and Weiss (1976) and Buxton, Davies and Lyons (1984). Reekie (1975) finds no significant concentration effect, whilst Gisser (1991) finds evidence of an inverse U relationship only for those industries with low price elasticity of demand. In general, evidence for the relationship has been restricted to consumer goods industries.

4.3.2 Collusion Over Advertising

Unfortunately, the theoretical basis behind the use of concentration measures is not satisfactory. In the first place, concentration measures may simply be picking up the fact that economies of scale are present in advertising when industries are more concentrated. Also, although we can expect collusion to increase along with market concentration, it is quite possible that, even within quite tight oligopoly structures, collusion is less likely over advertising than price.

There are several reasons for this. In the first place, advertising is less quantifiable than price. For example, a firm may believe that it can 'win' over advertising by running a better campaign than its rivals, whereas price cuts can be matched more easily. The time lag before the responding firm can initiate its own campaign may be another factor in this belief. A further possibility is that once a high advertising intensity is attained, it is difficult for a firm to reduce its advertising unilaterally. This ratchet effect (Else, 1966) may increase observed levels of advertising where firms react strongly to each other.

There is no reason to suppose that concentration measures can tell us the particular situations in which such collusion is likely to occur, *given any particular market structure*. In addition there are the well-known methodological drawbacks of even the best such measure (see for example Auerbach, 1989 pp.31-41). These problems are exacerbated when using firm level data. Partly this is due to the fact that a large number of firms operate in more than one industry (particularly at the commonly used 3- and 4-digit industry levels of disaggregation). In addition they say nothing about

size differences between firms within industries. This last problem may be solved by the inclusion of market share as an additional variable. However, as Ailawadi et al (1994) report, market share has rarely been significant in explaining the variance in advertising intensity between firms.

One final problem with the concentration approach is that the direction of causation is unclear. Advertising may be having an effect on concentration (through barriers to entry for example) at the same time as concentration is affecting the level of advertising and it is difficult to disentangle the two effects.

4.3.3 An alternative Approach

The approach taken by this chapter is to use firm level questionnaire data on both numbers of rivals and the nature of advertising reactions to explain differences in advertising between firms. Given the lack of existing data discussed earlier in the thesis and despite the potential pitfalls in using survey data, there are strong reasons for preferring such an approach.

One of the main methodological drawbacks with concentration and market share data is that firms are forced into artificially constructed industry (rather than market) classifications. In some cases the Standard Industrial Classifications (SICs) may lump together quite distinct markets. In others, the firm's perception of its market may straddle several SIC classifications.

Survey data allows managers to define their own markets and competitors as they see

fit. This is particularly useful in markets where international competition is important - a point on which traditional measures of concentration have consistently been criticised. In addition, the survey on which this chapter is based asks for information on how firms would expect to react to changes in rivals advertising. The questions are (deliberately) simplistic and, as with all survey data, the reliability of answers is open to debate. However, the questions do link in to the above story much more directly than do published concentration data.

When firms indicate that they would react to rivals, this is taken as evidence of interdependence between firms (and by definition a more oligopolistic market). As a consequence a higher level of advertising intensity is expected. When that reaction is seen as a collusive one, advertising intensity is expected to be somewhat lower. The proposed model is as follows:

> Advertising Intensity = f(number of rivals; firm reaction to rivals; nature of that reaction; firm specific variables; nature of market variables)

4.4 DATA AND VARIABLES

4.4.1 Data

As discussed in the previous chapter, data on advertising intensity and a variety of strategic responses are held for 325 firms. This information is then combined with data on company sales and profits taken from the Microexstat and FAME databases and with data on SIC 3-digit industry sales and concentration taken from the Census of Production.

Evidence on the advertising decision is considered for 316 firms, 253 (78%) of whom state that they advertise. The analysis of advertising intensity is restricted to the 221 advertising firms for which the relevant survey and other data is present. Five of these companies state that they currently spend nothing on advertising but indicate that they have done so in the past and may do so again at some time. For the purposes of this study these firms are counted as advertisers.

For 139 of these firms (nearly all manufacturing), data is also available for industry share, concentration and imports, at the three-digit level of disaggregation. This is used in order to relate this work to more conventional approaches.

4.4.2 Variables

Dummy variables are constructed from the survey data for firms who state they face less than five, and between five and ten rivals, and also for expected advertising reactions to rivals. Two sorts of reaction are classified: firstly, any reaction at all to a change in rival's advertising (React1) and, secondly, an asymmetric reaction where firms indicate that they would follow an increase by increasing advertising but would not react to a decrease (React2).

React2 corresponds to the collusive situation. There is little incentive to increase advertising as other firms will also increase. At the same time, there is no indication that firms would like to decrease their level of advertising. For example, in their reply to the survey, one manufacturing company stated "I am convinced that advertising (by one brand) would increase market share. Lack of advertising by

competitors is the main reason we do not spend on advertising". Thus, the coefficient on React1 is expected to be positive, and that on React2 negative.

Firm Specific Variables

Two firm specific accounting variables are considered: firstly, to control for economies of scale in advertising, the log of total sales during 1992 is included. Secondly, profit rates (both current and lagged by one year) are included as a proxy for the price-cost margin.

The survey was conducted at a time of fairly deep recession. Firms may react very differently to cyclical conditions. Some may attempt to 'buck the trend' by increasing advertising. In other cases firms may attempt to economise on advertising whilst some may be totally unaffected. Companies who say they decrease advertising in a recession can be expected to have lower observed advertising, other things being equal. Thus, a dummy variable is constructed for these firms. At the same time, high recorded levels of advertising may be due to factors affecting one firm at the time of the survey so a dummy variable for firms who state that they have increased advertising between 1985 and 1992 is also included[18].

Lastly, the log of the age of firm in years as of 1992 is included in the advertising intensity regressions. New firms are more likely to advertise heavily to establish a position in a market and thus this variable is expected to attract a negative coefficient.

[18]Omission of this variable changes the magnitude of the coefficients slightly and the significance tests not at all.

Market Variables

Most studies include a range of variables to allow for the importance of advertising in a market: the number of purchasers, fraction of sales made to order, stage in product life cycle and so on. The use of survey data enables us to use a single summary measure here. Firms were asked to rank different modes of competition (such as price, quality, advertising etc) in order of importance in their main market. Here, three dummy variables are experimented with for firms who rank advertising first, second and third respectively.

As these variables depend on the perceptions of managers, we also include two other market variables to control for consumer industries and for psychologically sensitive goods as follows.

Evidence for the advertising-concentration relationship has generally been restricted to consumer goods industries. Buxton et al (1984) demonstrate that restricting the estimation to consumer goods industries introduces a bias unless all the advertising and sales in those industries are aimed at consumers. This is certainly not the case for most (if not all) industries and Buxton et al use input-output tables to estimate the proportion of sales going to final consumers. Such data is not available at the firm level data, but clearly the problem remains. A brewery, for example, will advertise both to final consumers but also to the distribution and retail trade. Thus, an attempt is made here to estimate the percentage of advertising which is aimed at final customers. This calculation (described in Appendix 1) is somewhat subjective and is not without its own problems. However, it is felt to be a significant improvement on

simple sample restriction as used, for example, by Ailawadi et al (1994). Finally, following the work of Buxton et al (1984) and Cable (1972) a dummy variable is included for firms producing what may be considered psychologically sensitive goods.

It is expected that the coefficients on advertising-importance variables will be positive and significant. Those on the consumer and psychological goods dummies are also expected to be positive, but their significance will depend on how much variation is picked up by the advertising importance variables.

It should be noted that these latter two variables, as well as the ones accounting for cyclical variations, should not be seen as explaining differences in advertising intensity in a causative sense. Rather they act as controls to isolate the effect of other variables.

4.5. RESULTS AND INTERPRETATION

4.5.1 The Advertising Decision

The dependent variable considered here is whether firms advertise or not. As most of the firms who stated that they did not advertise did not answer other questions on the survey, this restricts explanatory variables to firm and industry level data obtained from external sources, for example, the FAME and Microexstat databases.

Of particular interest is the influence of company size as modelled by the log of sales. Also included is the percentage sales growth in the year prior to the survey as well as dummy variables for the broad classification of the firm's output (consumer non-

durables, consumer durables and producer goods). Lastly two industry variables (at the three digit level) are considered: industry share in 1991 and industry growth from 1989 to 1991[19].

The main results are reported in Tables 4.1a and 4.2. As the dependent variable is binary, probit estimation is used. Column 1 of Table 4.1a reports the estimates for the firm variables. The positive and significant coefficients on the dummy variables for consumer durables, non-durables and producer goods suggest that these firms have a higher likelihood of advertising than others (mainly those concerned with finance, primary industries and services). As might be expected from the threshold effect, firms with high sales seem more likely to advertise. Lastly, the sales growth variable attracts a negative coefficient. This suggests that a decrease in sales makes firms more likely to advertise, although the effect is not particularly significant.[20] None of the diagnostic statistics (for incorrect functional form, heteroscedasticity and non-normality) are significant at even the 10% level in this or subsequent columns[21].

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[19]1991 is chosen as the reference year rather than 1992 in order to maximise the sample size.

[20]Both rate of return and import variables were experimented with but were never significant. At first this might seem surprising as firms with low profits may not be able to afford to advertise. Indeed, several firms in the survey gave this as a reason why they were not currently advertising, even they had done so in the past. However, as noted above, these firms were categorised as advertisers in these estimations.

[21]The test for functional form tests for the inclusion of powers to the second, third and fourth degree and is distributed as $\chi^2(3)$. The test for heteroscedasticity tests the null hypothesis that the error variance = 1 and is distributed as $\chi^2(k)$ where k is the number of explanatory variables in the model. That for non-normality is a test for skewness and kurtosis in the error term and is distributed as $\chi^2(2)$. These tests are adapted from those described in Machin and Stewart (1990) for the ordered probit model.

In column 2, the two industry variables are included, reducing the sample size to 301 firms. Both industry growth and industry share seem to have a positive, but not very significant, effect on the probability of advertising, whist the sales effect virtually disappears.

We next focus on the threshold effect in firm advertising. The log of sales is replaced by a dummy variable equal to one if firms have annual sales less than a particular value. This critical value is estimated (according to that which provides the best fit for the model) as being £90 million. As reported in column 3, firms with sales less than £90 million seem to have a significantly lower likelihood of advertising than others. In addition the fit of the model is marginally better than with the continuous variable. Column 4 shows that the impact of this variable is reduced when the industry variables are included, but not to the same extent as the log of sales.

Table 4.1a reports the probability effects of the significant variables from column 3. Two features stand out. First, firms with annual sales less than £90 million seem to be about 15% less likely to advertise than others. Second there seems very little difference between the likelihood of non-durable, durable and producer firms deciding to advertise. There is little doubt that consumer firms tend to have higher advertising intensity than producer firms. Clearly there are indeed different factors influencing the two decisions and thus there is empirical justification for analysing them separately.

The significance of this £90 million figure is emphasised in Table 4.2 where the

sample is split into two: firms with annual sales greater than £90 million and firms with annual sales less than £90 million. In neither case does the log of sales have any significant effect. A chi-square test is carried out on the null hypothesis that coefficients are the same across the two samples. The $\chi^2(6)$ statistic works out at 6.6 which is not significant, even at the 1% level[22].

Diagnostic tests suggest some problems with both functional form and heteroscedasticity in the large firm sample. Thus, in column 3 the model is re-estimated for this sample with White standard errors (robust to heteroscedasticity). The conclusion remains unchanged - the level of sales only seems to have an effect on the advertising decision by imposing a minimum size (estimated at £90 million) below which firms are much less likely to advertise.

4.5.2 Advertising Intensity

Tables 4.3 - 4.8 summarise the main regression results on determinants of advertising intensity. The methodology taken here and elsewhere in the thesis is initially to focus solely on the specific variables of interest. A more general model is then estimated, incorporating other variables which may influence results. A simple model regressing advertising intensity on React1, React2 and the number of competitor variables is reported in column 1 of Table 4.3. As expected, the coefficient on React1 is positive and that on React2 is negative. Both are significant at the 1% level. The coefficients on the number of competitors variables are both positive, but neither are significant at

[22]Calculated as $\chi^2(k) = 2(L_1 - L_0)$ where L_1 and L_0 are the restricted and unrestricted log likelihoods respectively and k is the number of regressors.

conventional levels. The coefficient on the 0-5 competitors variable is not significant in any specification. Further models including this variable are accordingly not reported.

The diagnostic tests suggest problems with heteroscedasticity, functional form and normality[23]. When the various firm and industry variables are included in column 2, the explanatory power of the model is improved considerably and there is only weak evidence of functional form mis-specification. However, there is still a problem of heteroscedasticity suggesting that the standard errors are biased. Consequently, White standard errors, robust to heteroscedasticity are reported in column 3. This shows the psychological goods dummy, profit rate[24] and one of the advertising ranking variables not to be significant at any conventional level and these are therefore omitted from column 4. The significant test statistic for non-normality emphasises the importance of checking the robustness of results under other specifications such as Tobit estimation. This is done in Section 4.5.4 below.

In this more parsimonious model, the rival reaction variables still attract the expected signs, but significance is somewhat reduced. The coefficient on the 5-10 competitors

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[23]The test for functional form is a Ramsey Reset test based on the inclusion of the second, third and fourth powers of the fitted values. The test statistic is distributed as F(3, N-k) where N is the number of observations and k is the number of explanatory variables. The test for heteroscedasticity is the Cook-Weisberg test described in Goldstein (1992). The test statistic is $\chi^2(k)$. The test for non-normality is the Shapiro-Wilk test statistic. This is based on the null hypothesis of normally distributed residuals and is itself normally distributed.

[24]Lagged profits never approaches significance when included as an additional explanatory variable.

variable is positive and significant at all standard levels, suggesting that such companies do advertise more than those with either more or fewer rivals. Coefficients on the percentage of advertisements going to final consumers, the two remaining importance of advertising variables and the log of the firm's age are all significantly positive. Those firms who see advertising as a relatively important form of competition do advertise more. However, there is still an independent effect from the reaction and market structure variables. In contrast to previous work on the inverse U-curve, interacting the reaction and number of competitor variables with the percentage of advertisements going to final consumers (not reported here) does not improve the model.

There is also evidence of economies of scale in advertising as shown by the significantly negative coefficient on the log of sales. Lastly the two variables included to allow for cyclical effects both have their expected signs: positive for those who stated that they increased advertising between 1985 and 1992 and negative for firms who say they would decrease in a recession. The latter is only significant when interacted with the consumer variable and it is this specification that is reported in column 4.

4.5.3 Industry Specific Effects

One problem with our cross-sectional data is that effects assigned to variables such as React1, React2 and the number of competitors may be the result of industry specific factors. To test for this, the model is re-estimated including 49 SIC 2-digit industry dummy variables and results are reported in Table 4.4. The same procedure is

followed as before with column 3 reporting the more parsimonious and robust specification. The explanatory power of the model is somewhat increased as is the significance of both the reaction variables. The other important change from the previous specification is that the profit variable is now no longer significant at all. Thus, there seems to be little evidence of an independent effect running from profits to advertising intensity.

One further problem is that the diagnostic test for functional form fails even after the other variables are included. As a consequence, estimates using a log specification for advertising are reported in Section 4.5.4.

To give an idea of the magnitude of the effects implied by these results, column 3 of Table 4.4 indicates that, where firms expect to react to rivals, advertising will be about 3 percentage points higher than the competitive level. However, when this reaction seems to be a collusive one, advertising is much closer to the competitive level. In addition, firms operating in markets with between five and ten rivals have an advertising intensity about 1.5 percentage points higher than those in both more and less competitive markets.

Various experiments are performed to investigate the robustness of these results and are discussed in the following section.

4.5.4 Robustness Experiments

Tobit Estimation

As five of the firms included in the 221 sample do not currently advertise, Tobit estimation may be the more appropriate specification. In Table 4.5, Tobit estimates of the model both with and without the industry fixed effects are reported. In general, the implied marginal effects are lower under the Tobit specification. However, in the majority of cases the effects are in the same direction and at least as significant as under OLS. The coefficient on profit rate remains significantly positive (at the 5% level) even after the introduction of the industry fixed effects. However, it is likely that this is due to the presence of heteroscedasticity in the model. There seems little evidence that Tobit estimates are of more value in this instance.

Excluding Large and Small Firms

Schmalensee (1989) argues that it is useful to check for coefficient stability in cross-sectional work by constructing sub-samples where there may be significant differences. The most obvious source of variation here is across firm size. Thus, the model is re-estimated firstly excluding smallest and then the largest firms. The (arbitrary) cut-off point chosen for the smallest firms is sales of £10 million per year. For the largest firms, the cut-off is chosen at £500 million per year. These correspond very roughly to the top and bottom deciles of the distribution.

Results are reported in Table 4.6 and in both cases robust standard errors are reported. There is indeed some variation between the two models. When the smaller firms are excluded, the magnitude and significance of both the reaction variables

coefficients are greatly reduced. For every other variable, the two samples give estimates which are of the same order of magnitude.

Log Specification

The last experiment controls for the possibility that the model is being driven by a few very intensive advertisers. This is done by using a log specification for the dependent variable.[25] The general model (including industry fixed effects) is reported in Table 4.7, column 1 and the more parsimonious version in column 2. The diagnostic test statistics indicate that heteroscedasticity is not present in this specification, so White standard errors are not reported. In addition, the null hypotheses of correct functional form and normal errors cannot now be rejected. Support for the use of the survey variables to model market structure remains. The coefficient on React1 is positive and significant, whilst that on React2 is negative, although not significant at conventional levels. Once again, the number of competitors attracts a positive and significant coefficient.

4.5.5 Survey Data Versus Published Concentration Data

It is of particular interest to compare the present specification of the advertising/ market structure relationship, based on survey data, with more traditional approaches relying on published economic data. Industry concentration data is available for 139 firms in the sample. The traditional inverse U-curve theory suggests testing the following model:

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[25]Simple omission of those observations which have either a relatively high absolute residual or relatively high leverage has little effect on the results.

$$\frac{A}{S} = \alpha_0 + \alpha_1 CR5 + \alpha_2 (CR5)^2 + \beta' z + u_i \qquad (4.5)$$

where CR5 and $(CR5)^2$ are the linear and quadratic forms of the five-firm concentration ratio; z is a vector of firm and industry specific variables; u_i is an error term.

For an inverse U relationship, α_1 is predicted to be positive and α_2 negative.

Equation (4.5) is tested on the sub-sample of firms and results are reported in Table 4.8. In column 1, advertising intensity is regressed on both linear and quadratic 5-firm concentration ratios. The percentage imports in each 3-digit industry are included to control for biases from external trade. In addition, as the analysis here is at the level of the firm, industry share is also included. As expected, the sign on the linear concentration coefficient is positive, whilst that on the quadratic term is negative. Somewhat surprisingly, the coefficients on both industry share and imports are significantly negative. However, explanatory power of the model is extremely low.

Following the approach of Buxton et al (1984) the model is, henceforward, restricted to advertising aimed at final consumers. Thus, the market structure variables are interacted with the estimated percentage of advertisements aimed at consumers as before. On doing this, the explanatory power of the model is improved and the

coefficients on industry share and imports are no longer significant[26].

By way of comparison, the survey market structure variables (together with the consumer variable) are estimated for the same sample of firms (reported in column 2). The explanatory power of this specification is noticeably higher and, apart from the number of competitors variable, the results are fairly similar to those for the whole sample.

In columns 3 and 4, the other survey variables are included for each specification. The coefficients on the concentration variables are somewhat lower than previously (but still on the verge of significance) and the explanatory power is once again greater for the survey specification.

Thus, there is evidence that information gained from the survey explains advertising intensities better than published market structure data. The sample used here is possibly too small to generalise, but these results suggest that the use of survey data in firm level studies is a worthy competitor for so-called 'hard' economic data.

4.6 CONCLUSION

This chapter provides evidence that firms operating in the consumer goods sector are no more likely to advertise than those in the producer goods sector. On the other hand, firms above a critical, minimum size are significantly more likely to decide to

[26]Inclusion of the consumer variable on its own does not improve the fit of the model.

advertise.

Evidence is also provided on the determinants of firm advertising intensity. A novel approach is suggested to modelling the complicated relationship between market structure and advertising intensity, using firm level survey data. Advertising levels are found to be significantly higher where firms would expect to react to changes in rivals advertising. Where this reaction is perceived to be collusive to some degree, the level of advertising is lower. In addition, where firms perceive themselves to have between five and ten rivals, advertising is higher than when there are either more or fewer competitors. These effects are not dependent on the percentage of adverts aimed at final consumers. However, those firms that do advertise mainly to consumers do have higher levels of advertising.

These results prove reasonably robust to a number of experiments, although they seem to be somewhat dependent on firm size. Further, the survey data performs better than published market structure data on the same sample of firms.

Table 4.1a: Determinants of the Advertising Decision (probit estimates)

	1	2	3	4
Consumer Non-durables	0.7879***	.9917***	.8302***	.9816***
	(.2345)	(.2650)	(.2345)	(.2637)
Consumer Durables	1.050***	1.325***	1.083***	1.307***
	(.3599)	(.3903)	(.3610)	(.3893)
Producer	.7514***	.9984***	.7674***	.9755***
	(.2162)	(.2590)	(.2171)	(.2588)
Log Sales	.1207**	.0297		
	(.0479)	(.0626)		
Sales < £90m			-.5282***	-.3686*
			(.1738)	(.1940)
Sales Growth	-.2790	-.2968	-.3026*	-.2982
	(.1851)	(.2014)	(.1829)	(.2006)
Industry Growth		1.371*		1.325*
		(.7078)		(.7085)
Industry Share		1.173		.9276
		(.7970)		(.6448)
Constant	.2961	.2514		-.0930
	(.2547)	(.3075)		(.2723)
N	316	301	316	301
Pseudo R2	.1003	.1177	.1093	.1288
Log Likelihood	-146.9	-135.1	-145.4	-133.9
Mean Dependent Variable	0.7897	0.7940	0.7897	0.7840
Functional Form	1.703	1.273	1.320	1.187
Heteroscedasticity	1.091	2.093	4.681	1.980
Non-normality	.6155	.8225	.0819	.0376

Notes

1. Dependent variable is = 1 if the firm indicates that it advertises; = 0 otherwise.
2. Standard errors in brackets.
3. * indicates coefficient is significant at 10% level; ** at 5% level; *** at 1% level.

Table 4.1b: Probability Effects (from Table 4.1 Col 3)

Variable	Increased Probability (%)
Non-durables	19.51
Durables	18.87
Producer	20.13
Sales Less than £90m	-15.60

NOTES:
1. Probabilities are worked out as the increase in probability of firms advertising when the dummy variable takes the value 1 compared to when the variable takes the value 0, evaluated at the mean of the other variables.

Table 4.2: The Advertising Decision: large and small firms

	1 Small Firms	2 Large Firms	3 Large Firms
Consumer Non-durables	1.027***	.6894*	.6894*
	(.3131)	(.3967)	(.4072)
Consumer Durables	1.216**	1.042*	1.042*
	(.4774)	(.5875)	(.5733)
Producer	.8525***	.8414**	.8414**
	(.2809)	(.3873)	(.3839)
Log Sales	-.0790	.1029	.1029
	(.1107)	(.1296)	(.1108)
Sales Growth	-.4318*	.3715	.3715
	(.2529)	(.6347)	(.4414)
Constant	-.1331	.1452	-.1452
	(.3575)	(.8675)	(.7915)
N	175	141	141
Pseudo R2	.1054	.0560	.0560
Log Likelihood	-92.8	-50.8	-50.8
Mean Dep Variable	0.7200	0.8723	0.8723
Functional Form	2.250	14.31***	-
Heteroscedasticity	5.818	19.63***	-
Non-normality	.7995	1.111	-

Notes

1. Standard errors in brackets in 1 and 2. White standard errors in brackets in 3.
2. For other notes see Table 4.1

Table 4.3: OLS Estimates of Advertising Intensity

	1	2	3	4
React1	3.541***	2.819***	2.819*	2.875*
	(.8464)	(.7236)	(1.574)	(1.551)
React2	-2.942***	-2.342***	-2.342	-2.349
	(.9018)	(.7604)	(1.570)	(1.556)
5-10 Competitors	.5650	.9503**	.9503**	1.005**
	(.4522)	(.3766)	(.4085)	(.4296)
0-5 Competitors	.0998			
	(.4511)			
% Consumer		.0148***	.0148***	.0173***
		(.0039)	(.0038)	(.0041)
Psychological		1.592**	1.592	
		(.7728)	(1.159)	
Adv Ranked 1		.7884	.7884	
		(.6932)	(.8814)	
Adv Ranked 2		1.373**	1.373***	1.256**
		(.5356)	(.4998)	(.5130)
Adv Ranked 3		2.252***	2.252***	2.369***
		(.4352)	(.5010)	(.5302)
Log Sales		-.3056***	-.3056***	-.3253***
		(.0824)	(.0837)	(.0848)
Profit Rate		1.197*	1.197***	1.180***
		(.6842)	(.4357)	(.4536)
Increased Adv		.4850	.4850	
		(.3086)	(.3128)	
Decrease in Recess*Cons		-.0152***	-.0152***	-.0174***
		(.0052)	(.0058)	(.0057)
Log Age		-.3010**	-.3010**	-.2633**
		(.1362)	(.1332)	(.1344)
Constant	1.474***	2.664***	2.664***	2.837***
	.2261	(.4171)	(.6620)	(.6737)
N	221	221	221	221
Adj R^2	.0660	.3440	.3561	.3344
F Statistic	4.9***	10.62***	-	-
Heteroscedasticity	45.35***	106.5***	-	-
Functional Form	6.19***	2.17*	-	-
Non-normality	33.18***	15.2***	-	-

Notes:

1. Dependent variable is (advertising*100/sales).
2. Standard errors in brackets in 1 and 2. White standard errors in bracket in 3 and 4.
3. * indicates coefficient is significant at 10% level; ** at 5% level; *** at 1% level.

Table 4.4: OLS Estimates of Advertising Intensity (including industry effects)

	1	2	3
React1	2.903***	2.903**	2.850**
	(.7862)	(1.446)	(1.440)
React2	-2.682***	-2.682*	-2.727*
	(.8422)	(1.493)	(1.491)
5-10 Competitors	.9194**	.9194**	.9606**
	(.4172)	(.4267)	(.4339)
% Consumer	.0154***	.0154***	.0171***
	(.0052)	(.0049)	(.0049)
Psychological	1.409	1.409	
	(1.001)	(1.071)	
Adv Ranked 1	.7733	.7733	
	(.7253)	(.9192)	
Adv Ranked 2	1.393**	1.393***	1.310**
	(.6737)	(.5259)	(.5101)
Adv Ranked 3	2.105***	2.105***	2.070***
	(.4860)	(.5172)	(.0840)
Log Sales	-.2747***	-.2747***	-.2707***
	(.0979)	(.0900)	(.0840)
Profit Rate	.7569	.7569	
	(.7489)	(.5191)	
Increased Adv	.5740*	.5740*	.6571**
	(.3338)	(.3125)	(.3140)
Decrease in Recess*Cons	-.0167***	-.0167***	-.0172***
	(.0058)	(.0056)	(.0057)
Log Age	-.2991**	-.2991	-.2996**
	(.1371)	(.1227)	(.1264)
Constant	4.256***	4.256***	4.154***
	(1.100)	(.8830)	(.9170)
N	221	221	221
Adj R^2	.3608	.3608	.3559
F Statistic	3.34***	-	-
Heteroscedasticity	92.0***	-	-
Functional Form	8.56***	-	-
Non-normality	5.61***		

Notes:
1. Standard errors in brackets in 1. White standard errors in brackets in 2 and 3.
2. For other notes see Table 4.3

Table 4.5: Tobit Estimates of Advertising Intensity

	1 Basic Model	2 Marginal Effects	3 With Industry Effects	4 Marginal Effects
React1	2.855*** (.7127)	2.501	2.951*** (.6930)	2.660
React2	-2.347*** (.7438)	-1.664	-2.689*** (.7421)	-2.206
5-10 Competitors	.9938*** (.3676)	0.850	.9634*** (.3682)	0.737
% Consumer	.0152*** (.0038)	0.012	.0158*** (.0046)	0.014
Psychological	1.609** (.7520)	1.439	1.388 (.8816)	1.238
Adv Rank 1	.7820 (.6744)	0.677	.7579 (.6392)	0.658
Adv Rank 2	1.318** (.5653)	1.161	1.374** (.5988)	1.235
Adv Rank 3	2.258*** (.4235)	1.797	2.109*** (.4284)	1.950
Log Sales	-.3079*** (.0810)	-0.252	-.2826*** (.0867)	-.2574
Profit Rate	1.185 (.6669)	0.970	.7791 (.6600)	0.710
Increase Adv	-.5269* (.0051)	0.435	.5982** (.2944)	0.460
Decrease in Recess*Cons	-.0151*** (.0051)	-0.012	-.0162*** (.0051)	-0.015
Log Age	-.2934** (.1341)	-0.240	-.2888** (.1433)	-0.263
Constant	2.573*** (.5587)		4.082** (2.058)	
N	221		221	
Adj R^2	0.1068		0.1542	
Log Likelihood	-461.83		-437.33	
Standard Error	2.0133		1.800	
Mean Dep Vble	1.863		1.863	

Notes:

1. For continuous variables, marginal effects are calculated as $b.F(bx_i|s)$ where s = standard error and F(.) is the cumulative normal distribution.
2. For dummy variables, marginal effects are calculated as the $[E(y|x_i$ when dummy variable = 1)] - $[E(y|x_i$ when dummy variable = 0)], where $E(y|x_i) = F(bx_i|s).bx_i + s.f(bx_i|s)$ and f(.) is the ordinate for the standard normal density (see Greene 1993, p.694-5).
3. Figures in brackets are standard errors.
4. For other notes see Table 4.3

Table 4.6: OLS Estimates of Advertising Intensity (excluding large/small firms)

	1 Sales > £10m	2 Sales < £500m
React1	1.828	3.908*
	(1.314)	(2.033)
React2	-1.605	-4.032**
	(1.356)	(2.022)
5-10 Competitors	1.232***	.9359**
	(.3801)	(.4730)
% Consumer	.0122**	.0161***
	(.0048)	(.0055)
Psychological	1.981*	.3414
	(1.157)	(1.098)
Adv Ranked 1	1.849*	.8455
	(1.016)	(.8630)
Adv Ranked 2	1.349***	1.659***
	(.4693)	(.5989)
Adv Ranked 3	2.278***	2.120***
	(.5471)	(3.865)
Log Sales	-.2800***	-.2589*
	(.0877)	(.1451)
Profit Rate	.4395	.4159
	(1.397)	(.5294)
Increased Adv	.6472**	.6804**
	(.3106)	(.3097)
Decrease in Recess*Cons	-.0148***	-.0160***
	(.0053)	(.0057)
Log Age	-.2551**	-.2163
	(.1191)	(.1371)
Constant	3.816***	3.946***
	(.7918)	(1.292)
N	198	188
Adj R^2	.3904	.3793

Notes:
1. White standard errors in brackets.
2. Includes industry fixed effects.
3. For other notes see Table 4.3.

Table 4.7: OLS Estimates of Advertising Intensity (log specification)

	1	2
React1	.8957**	.8849**
	(.4242)	(.4219)
React2	-.6995	-.7011
	(.4542)	(.4523)
5-10 Competitors	.3995*	.4070*
	(.2260)	(.2239)
% Consumer	.0061**	.0052**
	(.0028)	(.0024)
Psychological	.3242	
	(.5393)	
Adv Ranked 1	.4326	
	(.3913)	
Adv Ranked 2	1.277***	1.336***
	(.3774)	(.3717)
Adv Ranked 3	1.289***	1.278***
	(.2627)	(.2561)
Log Sales	-.1805***	-.1832***
	(.0534)	(.0519)
Profit Rate	.3842	
	(.4041)	
Increased Adv	.2864	.3434*
	(.1808)	(.1757)
Decrease in Recess*Cons	-.0040	
	(.0031)	
Log Age	-.1197	
	(.0882)	
Constant	1.638	.8817
	(1.262)	(1.191)
N	216	216
Adj R^2	.3564	.3545
F Statistic	3.25***	3.46***
Heteroscedasticity	.09	.18
Functional Form	.41	.60
Non-normality	.14	.09

Notes:
1. Standard errors in brackets in 1. White standard errors in brackets in 2.
2. Includes industry fixed effects.
3. For other notes see Table 4.3.

Table 4.8: Explaining Advertising Intensity: concentration versus survey data

	1	2	3	4	5
CR5	5.151*				
	(2.500)				
$CR5^2$	-3.689				
	(2.584)				
Industry Share	-.9305***				
	(.2637)				
CR5 * % Consumer		.0670**		.0477**	
		(.0261)		(.0240)	
$CR5^2$ * % Consumer		-.0606*		-.0588*	
		(.0350)		(.0331)	
Industry Share * % Consumer		-.0102		.0102	
		(.0092)		(.0105)	
Imports	-.0211***	-4.07 e-3		1.27e-3	
	(.0104)	(8.99 e-3)		(8.63e-3)	
% Consumer			.0139***		.0103**
			(.0046)		(.0047)
React1			3.535**		3.114***
			(1.442)		(.7297)
React2			-2.876*		-2.405***
			(1.496)		(.7440)
5-10 Competitors			.1400		.3163
			(.4544)		(.3770)
Constant	.0238	1.374***	1.038***	1.566***	1.469***
	(.5893)	(.2754)	(.2112)	(.5053)	(.4012)
Control variables included	No	No	No	Yes	Yes
N	139	139	139	139	139
Adj R^2	.0295	.0919	.1452	.3444	.3964

Notes:
1. White standard errors in brackets.
2. Control variables are as in Table 4.4, Column 1.
3. For other notes see Table 4.3

Chapter 5

ADVERTISING AND PROFITABILITY

5.1 INTRODUCTION

The link between advertising and profitability has long been a key focus for empirical studies. Many authors have reported a positive correlation between industry accounting profits and advertising intensity. The majority of such studies (and nearly all of those testing UK data) have been at the industry level. Comanor and Wilson (1974), Cowling et al (1975), Strickland and Weiss (1976), Weiss (1991), Domowitz, Hubbard and Peterson (1986), Rosenbaum (1993) all find evidence of a positive correlation at the industry level, usually restricted to (or at least stronger in) consumer goods industries.

The correlation has also been found by US firm level studies such as Shepherd (1972), Hirschey (1985), Megna and Mueller (1991) and Ailawadi et al (1993). Ravenscraft (1983) finds that industry advertising has a positive impact on firm profitability whilst firm advertising has no significant effect. However, no distinction is made between firms acting in consumer and producer industries which may have biased the result somewhat.

The interpretation of this relationship has been the subject of much debate. Three different theories can be distinguished:- that advertising leads to monopoly profits; that the observed relationship is merely due to accounting practices; and that high profits lead to higher levels of advertising.

The traditional view (taken by, amongst others, Comanor and Wilson, 1974; Cowling et al, 1975) is essentially the "advertising as persuasion" approach explored in Chapter 2. That is, advertising raises barriers to entry in some industries, allowing firms to make monopoly profits. In addition it can help to differentiate products and thus decrease price sensitivity with the same result on profit margins. The policy implication is essentially that high advertising should be viewed as a potential area for monopoly legislation much in the same way as other monopolistic practices.

Although a positive association correlation between advertising and monopoly profits is a necessary condition to accept the persuasion view, it is not conclusive evidence. The observed relationship is consistent with at least two other explanations. Firstly, it may simply be due to methods of accounting. Advertising tends to be treated as a current expense rather than as an investment in intangible capital. If its effects last for more than one accounting period, the firm's equity will be underestimated and the absolute value of profits overstated. If advertising has a low depreciation rate then the rate of return on equity is likely to be overstated quite significantly for firms that have high levels of advertising.

The results of empirical studies which have adjusted for this bias are, not surprisingly, dependent on the rate of depreciation used. Bloch (1974) uses a low depreciation rate of 5% and finds that the positive correlation between advertising intensity and rates of return disappears when advertising is treated as a form of intangible capital. On the other hand, both Comanor and Wilson (1974) and Weiss (1991) find that the positive relationship is unchanged or even reinforced as long as the depreciation rate used is

not excessively high.

The third interpretation is that causation may go from profits to advertising. As was shown in Chapter 4, the Dorfman and Steiner (1954) hypothesis predicts that it is optimal for firms to set advertising as a fixed proportion of sales and for this proportion to be larger, the bigger is the firm's price cost margin. The intuition is simple. If advertising gains a firm more customers, then advertising is more worthwhile the greater is the profit on each extra unit of the good sold. If the Demsetz (1973) view that monopoly profits are the result of firm efficiency is accepted, then high advertising will be a consequence of productive efficiency rather than a cause of allocative inefficiency.

Similarly, Nelson's 1974 hypothesis that advertising acts as a signal of high quality offers another route for profitability and advertising to be positively correlated. Firms producing high quality products (and making greater profits per unit than would be possible for low quality goods) advertise more in order to signal this quality. High levels of advertising then reflect a quality premium rather than any monopoly power.

Several authors (e.g. Comanor and Wilson, 1974; Strickland and Weiss, 1976, Geroski, 1982; Rosenbaum, 1993) have attempted to control for endogeneity by using simultaneous equation estimation, finding that advertising still seems to cause an increase in profitability in consumer industries. However, as discussed in Chapter Two, Schmalensee (1989) argues that valid instruments for endogenous variables in cross-sectional industry studies are virtually non-existent. Therefore, the fact that

both single- and simultaneous-equation methods yield similar results tells us very little as "the relation between these estimates is entirely determined by the set of variables used as instruments" (p.955).

Schmalensee calls for cross-sectional industry studies to concentrate on providing "empirical regularities that seem to be robust" (p.959) rather than claiming to be able to explain the underlying structural parameters of a model. It is in that spirit that the empirical work in this chapter is undertaken.

The initial approach is to examine the impact of advertising on profitability over a cross-section of UK firms. Particular attention is paid to the treatment of advertising in the calculation of profit rates. Secondly a new approach is suggested which aims to avoid the problem of distinguishing causation. This is to focus on a possible role for advertising in affecting the likelihood of firms going into receivership.

The next section of the chapter presents a description of the data and specifies the initial model to be estimated. The following two sections report and discuss the two approaches to investigating the effect of advertising on profitability. Some concluding remarks are made in the final section of the chapter.

5.2 DATA

Figures for advertising intensity in 1992 are available for 301 firms. Data on turnover, profits before tax and fixed tangible assets are obtained for each firm from 1991-1993 using the FAME database. Missing data for some of these variables

reduces the sample size in the econometric work to 272[27].

The appropriate dependent variable for profitability is the subject of some debate (see Schmalensee 1989, p.961 for a discussion). Here I follow Cowling et al (1975) and use the mark up of price over marginal cost (the price-cost margin). Under the assumption of long-run constant returns to scale, the price-cost margin for firm i can be given by:

$$pcm_i = \frac{[p_i - avc_i - (g + \delta)\frac{k_i}{q_i}]}{p_i} \tag{5.1}$$

where avc = average variable costs; p = price; q = output; k = capital; g = competitive rate of return; δ = depreciation rate of capital (see Schmalensee, 1989, p.960)

$$pcm_i = \frac{p_i q_i - avc_i.q_i}{p_i q_i} - \frac{(g + \delta).k_i}{p_i q_i} \tag{5.2}$$

$$pcm_i = \frac{s_i - vc_i}{s_i} - \frac{(g + \delta).k_i}{s_i} \tag{5.3}$$

where s_i = value of sales for company i.

$$pcm_i = \frac{\pi_i}{s_i} - \frac{(g + \delta).k_i}{s_i} \tag{5.4}$$

where π_i = profit for firm i.

The first expression of the right hand side of equation (5.4) is zero under competitive

[27]The sample size in the previous chapter was restricted by the use of data gained from survey questions which were answered by fewer firms.

conditions, when only a normal rate of return is being made. Returns above this level can be considered supernormal profits which are a function of various firm- and industry-level variables.

Thus the following equation is modelled:

$$(\frac{\pi}{S})_i = a_0 + (g + \delta).(\frac{k}{S})_i + A.z_i + B.w_j + u_i \qquad (5.5)$$

where z is a vector of variables (including advertising) for firm i; w is a vector of variables for industry j in which firm i operates and u_i is an error term.

Following recent work, such as that of Machin and Van Reenan (1993), the measure of profits used is "pre-tax operating profits", whilst capital is measured by "tangible fixed assets"[28]. The sensitivity of results to this measure of the price cost margin is explored below on a restricted sample of firms.

Advertising is lagged by one year in order to go some way in alleviating problems of causality. Thus the model attempts to examine how advertising affects future profitability of firms. As advertising in different years is likely to be quite highly correlated, the problem does not disappear and this theme is returned to later in the chapter.

It is not clear which is the appropriate measure to use for advertising. The majority

[28]See Appendix One for details of the construction of the variables.

of authors have used the ratio of advertising expenditure to sales.[29] This has the advantage of comparing the intensity of advertising across firms of different sizes, although the presence of economies of scale in advertising may bias the measure somewhat (see Chapter 3). Cowling et al (1975) suggest, however, that the relevant variable for investigating profitability should be total advertising expenditure. Advertising is hypothesised to affect excess profits through erecting entry barriers rather than just in its own right. Entry barriers are more likely to be dependent on the number of advertising messages received. As a consequence, total advertising expenditure rather than advertising intensity seems to be the appropriate specification.[30] For example a firm selling a relatively expensive item such as a home computer may register a much lower advertising to sales ratio than a firm selling confectionary even though it may send out the same amount of advertising messages. Despite the intuitive appeal of this argument, total expenditure has rarely been used as the advertising variable. In this study, both variables are considered.

5.3 EFFECT OF ADVERTISING ON PROFIT MARGINS

5.3.1 Basic Model

Table 5.1 presents simple correlations between profit margins and both advertising intensity and total advertising. In order to get some idea of the direction of causation, correlation coefficients are reported for advertising in 1992 and profitability across

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[29]The validity of using current advertising expenditure rather than some measure of goodwill stock is examined in section 5.3.4 below. Further justification is provided by the results of Chapter 6.

[30]An exception to this is where firms are able to identify, and target directly, potential consumers.

three years: 1991, 1992 and 1993.

There is a weak, positive correlation for both advertising specifications with the exception of lagged profits and advertising intensity. The correlation for total advertising becomes stronger in each year. For advertising intensity, the correlation is at its strongest for 1992 profits. The pattern is the same when the sample is restricted to firms operating chiefly in consumer markets, but the positive correlations are higher and somewhat more significant. In this sample, the correlation with total advertising is consistently stronger than for advertising intensity.

On the basis of these simple correlations, there seems to be less evidence of a causative link running from profits to advertising than the other way round. Further, there seems to be some evidence that total expenditure has a stronger effect than advertising intensity. However, particular care must be taken with the total advertising correlations. They may simply be reflecting higher profitability for larger firms and, also, the fact that larger firms are more likely to advertise (see Chapter Three). This is explored in more detail below.

Table 5.2 presents estimates of the determinants of profit margins using advertising intensity as an independent variable. Again, the starting point is the simplest model, focusing solely on advertising intensity. Column 1 shows that, across the whole sample of firms, advertising intensity attracts a positive, but insignificant, coefficient. As expected, the coefficient on capital intensity is significantly positive throughout the regressions. In column 2, the advertising effect is distinguished for consumer and

non-consumer firms by using interaction terms. The coefficient on the interaction term between advertising and consumer firms is positive and significant at the 5% level. The coefficient on the interaction term between advertising and non-consumer firms is negative, but completely insignificant. It remains so in all specifications and, thus, models which include it are not reported. This result, that advertising intensity has an effect on profits only in consumer-goods industries, is consistent with previous work discussed earlier (e.g. Domowitz et al, 1986; Megna and Mueller, 1991).

The diagnostic statistics suggest that the null hypotheses of homoscedastic error terms and non-normality be rejected[31]. Hence standard errors robust to heteroscedasticity are estimated and reported from column 3 onwards, with no effect on the significance of any of the variables.

Columns 4 and 5 report controls for firm and industry specific effects. Various firm and 3-digit industry specific variables are included in Column 4: firm size as measured by the log of tangible assets[32]; industry share in 1992; industry import intensity in 1992; industry growth from 1990-92. Inclusion of these variables restricts the sample to 242 firms. Only the industry growth variable is significant at the 10% level or better. The advertising coefficient is reduced only marginally (from 0.97 to 0.93) and remains significant. In the light of both the small impact of these variables

[31]See Chapter Four for a description of the diagnostic tests.

[32]Sales and employment were used as alternative measures of firm size (in both linear and log forms), with similar results.

and the reduction in sample size, they are not included henceforward[33].

In Column 5, dummy interaction variables between capital intensity and each two-digit industry are included. In effect, this is allowing for the normal rate of return and the depreciation rate to vary across industries as suggested by Schmalensee (1989). Also included are dummy variables for each of the two-digit industries. The explanatory power of the model increases greatly but the coefficient on the advertising variable is barely altered.

The initial conclusion is not a new one: advertising seems linked to firm level profitability for those firms working in consumer based industries.

5.3.2 Long Run Effects

In order to distinguish the long run effects of advertising, Table 5.3 includes a lagged profit rate variable. The explanatory power of the model is increased dramatically. The coefficient on advertising is reduced by about half and is now no longer significant at conventional levels[34]. This result is unchanged when robust standard errors are calculated (in column 2) and when the coefficient on the capital intensity variable is allowed to vary across industries (column 3).

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[33]It should be noted that this result is inconsistent with some previous work showing that market share is positively correlated with firm level profitability (for a survey of such studies, see Schmalensee, 1989 p.983-4).

[34]There is some suggestion of a problem with functional form. Inclusion of a quadratic advertising term improves the fit of the model marginally, although neither advertising coefficient is significant at the 5% level.

The long run effect of advertising can be calculated as (a/1-b) where a is the coefficient on advertising and b the coefficient on lagged profits. When the industry dummy variables are not included, the long run effect of 1.616 (from Table 5.3, column 2) is considerably larger than the short run effect of 0.966 (from Table 5.2, column 3). However, when the industry dummy variables are included (Table 5.3, column 3) the long run effect goes down to 0.711 whereas the short run effect is 0.912 (Table 5.2, column 5).

Given the insignificance of the advertising variable in the long run, this seems consistent with advertising acting as a fixed effect which has a long run impact on the profitability of consumer firms. The persistence of differences in profits between firms over time is well documented (see for example Mueller, 1990). The evidence presented here is consistent with advertising playing a part in this persistence of profits. Thus, once lagged profits are included, the effect of current advertising is 'washed out'.

5.3.3 Total Advertising

Table 5.4 reports similar estimates including both advertising intensity and total advertising expenditure (in millions). Column 1 shows neither to be significant across the whole sample. However, when the effects are restricted to consumer based firms (in column 2) and standard errors are adjusted for heteroscedasticity (in column 3), the total advertising coefficient is strongly significant and much more so than that on

advertising intensity[35].

As discussed earlier, the positive correlation between total advertising and profits may be caused by the influence of firm size. This is controlled for in columns 1-3 by including the log of assets as an independent variable. However, once again the coefficient on this variable is never significant and its inclusion has little effect on the total advertising coefficient. It is thus omitted from subsequent regressions.

The effect of advertising may not seem large: an increase in advertising expenditure of one million pounds per year appears to increase profit margins by about 0.1 of a percentage point[36]. However, given that the heaviest advertisers in the sample spend in excess of £10 million, the effect of very large advertisers is not negligible. Once again the coefficient is changed only marginally when industry dummy variables are included. It is reduced on the introduction of lagged profit rates (reported in column 5), but remains significant, unlike that on advertising intensity.

5.3.4 Advertising as Capital

The accounting interpretation of the advertising-profitability relationship is now examined. Weiss (1991) derives expressions both for profits and equity adjusted for advertising as an intangible asset. Assuming that advertising is growing at a constant

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[35]The test statistic for non-normality is significant at the 5% level in both columns 1 and 2, suggesting another possible problem with least squares estimation.

[36]When advertising intensity is excluded from the model, the implied effect on profit margins of a one million pound increase in advertising rises to 0.15 of a percentage point.

percentage rate and that it decays exponentially, true profits (π^*) are given by:

$$\pi^* = \pi_t + A_t - \textit{depreciation on intangibles} \tag{5.6}$$

$$\pi^* = \pi_t + A_t \frac{(1 - \lambda).r}{(r + \lambda)} \tag{5.7}$$

and true assets (k^*) by:

$$k^* = k_t + \textit{accounting expenditure on intangibles} - \textit{depreciation on intangibles} \tag{5.8}$$

$$k^* = k_t + A_t \frac{(1 - \lambda)(1 + r)}{(r + \lambda)} \tag{5.9}$$

where π_t, k_t = current accounting profits and assets respectively.

λ = rate of depreciation of advertising.

A_t = current advertising expenditure.

r = rate of growth of advertising.

(This follows Weiss, 1991 p.218)

If all advertising effects are restricted to one year ($\lambda = 1$), then accounting profits and equity equal their true values. In general, profits are underestimated and equity overestimated by a greater amount the higher is the growth of advertising and the lower is the depreciation rate. In such a case, the relationship between advertising and accounting profits will be biased upwards. If advertising is constant from year to year, depreciation on advertisements equals current spending. Again accounting and true profits will coincide, although accounting and true capital will not.

The first issue, in a cross-section sample such as this, is to estimate the growth rate of advertising. Rather than restrict all firms to the one assumed growth rate, data gained from question three of the survey is used to divide firms into three groups[37]:

(i) firms who state that they increased their advertising since 1985.

(ii) firms who state that they decreased their advertising since 1985.

(iii) firms who state that their advertising was unchanged since 1985.

Examination of the restricted sample of firms for which data on advertising exists over several years suggests that both the average annual increase and the average decrease in advertising for the first two groups respectively was approximately 30%. Consequently r is set equal to 0.3 for firms in group (i), r = -0.3 for firms in group (ii) and r = 0 for those in group (iii).

Both π and k are adjusted accordingly using three different advertising depreciation values: 0.9, 0.7 and 0.5[38]. Results are reported in Tables 5.5a-c respectively. In each of these cases the advertising effects are remarkably robust. Somewhat surprisingly, the effect of advertising intensity increases (albeit only marginally) with the rate of depreciation. The effect of total advertising does decrease slightly as depreciation rates go up. In each case, total expenditure continues to perform better

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[37]The model was also estimated imposing the same value of r across the whole sample. The results are generally robust, with the exception of the case where λ = 0.5 and r = -0.3. In that case, although total advertising remains significant, the effect of advertising intensity disappears.

[38]The 5% rate used by Bloch (1974) is not considered here in the light of a good deal of evidence in favour of much higher rates (see Chapter Six).

than advertising intensity and the effects of both these variables are decreased on the introduction of lagged profitability.

There is little evidence here that the assumption of advertising as current expenditure as opposed to an investment leads to a false interpretation of its effects. The issue certainly needs to be treated seriously, however, and a more rigorous look at the depreciation rate of advertising (in the context of sales) is undertaken in the next chapter.

5.3.5 Alternative Measure of Profit Margins

It is possible that results are sensitive to the specification of the dependent variable[39]. The alternative measure used here is gross profits/sales in 1993 taken from the FAME database. Use of this variable reduces the available sample of firms to 202.

Five of the key regressions from earlier in the chapter are re-estimated with the new dependent variable and results are reported in Table 5.6. Clearly gross profits will result in higher coefficient estimates. It is useful, however, to compare the relative significance of the variables under the two measures.

In the first column, the basic model from Table 5.2, column 2 is re-estimated. The main difference is that advertising intensity has a positive (but not significant) effect on profitability for producer firms. However, the consumer firm effect is larger and

[39]See Dowrick (1990) for an example where the choice of price cost margin does make a difference at the industry level.

remains significant.

In column 2, total advertising expenditure is included along with the firm size control. Again, the coefficient on total advertising is much more significant than that on advertising intensity. The firm size coefficient, however, is negative although only significant at the 10% level. This pattern is repeated in column 3 when the industry and industry share controls are included. Once again, industry growth from 1990 to 1992 is the only control variable to have any impact.

Lagged profitability is included in column 4 and here the main difference to the pre-tax profit regressions surfaces. Lagged profitability improves the fit of the model, but not to the same extent as before. Further, the total advertising variable remains significant even at the 1% level.

In sum, although the magnitude of the coefficients are sensitive to the alternative profitability measure, the conclusions to be drawn from the results are little changed.[40]

5.4 ADVERTISING AND FIRM EXIT

5.4.1 Empirical Model

The potential endogeneity problem in advertising-profitability studies is unlikely to be solved with complete satisfaction. One way around the problem is to focus on

[40]In a further experiment, not reported here, the key results prove essentially insensitive to the omission of observations with relatively high absolute values of residuals and leverage.

measures of firm performance that are unlikely to have a two-way causal relationship with advertising.

The measure suggested here, which has hitherto not been tested explicitly, is firm failure. If there is a causal link running from advertising to profitability, then firms who do not advertise highly may be more likely to exit from the industry through receivership than others. The advertising decision pre-dates this measure of firms performance. There is no direct link from exit in period t to advertising in period t-1.

The endogeneity problem is not completely eradicated, however. A firm that is in financial trouble may be forced to cut back on advertising expenditures. In this case, exit in period t would be correlated with profitability in period t-1 or earlier. In turn, lagged profitability may be correlated with advertising in period t. Exit from the industry would still be associated with low advertising, but the direction of causation would be going from profitability to advertising. However, it is possible to allow for this eventuality to some extent by using lagged profitability as a control. At the very least, it is certain that the advertising decisions pre-date the actual exit of the firm.

As most UK advertising data has been published only at product level, there has been little scope to examine whether any such link exists. The only US study of firm exit which has included advertising as a dependent variable is that by Audretsch (1994). In this study of US firms, which uses logit regressions, advertising intensity is found to be have a weak, positive impact on firm exit. Kamshad (1994) use probit estimators to examine the probability of exit across French firms, focusing on

ownership structure. In this case, advertising is not included. A similar approach to both these studies is taken here (on a much smaller sample).

A univariate probit model is used. Let y^*_i be an unobserved variable measuring to firm performance:

$$y^*_i = B'z_i + u_i \qquad (5.10)$$

where z is a vector of factors, including advertising, that affect firm performance.

The observed variable is y:

$$y_i = 1 \text{ if } y^*_i < 0$$

$$= 0 \text{ if } y^*_i \geq 0.$$

y_i is constructed as follows:

$y_i = 1$ if firm i went into receivership (as classified by the FAME database) during the two years following the survey in May 1992

$= 0$ otherwise.

Out of 324 firms for which data is available, 19 (5.86%) went into receivership between May 1992 and May 1995. Clearly this is a limited sample size, and so results should be interpreted with caution. It is useful initially to check for selection bias. Out of the 970 other firms who were included in the survey and who could be traced, 44 (4.54%) went into receivership during the period in question. A z-test of the null hypothesis that the proportions are equal cannot be rejected even at the 10%

level of significance (z-statistic = 0.898).

5.4.2 Factors Affecting Exit

In addition to advertising, two other variables are included in the vector, z, to explain the probability of exit. The first is the age of the firm. Experienced firms are less likely to go into receivership than relatively new entrants. The relationship is unlikely to be linear. Rather, the probability of exit is likely to be decrease with age in the early years of the firm's existence. Once firms are established, however, there should be no correlation. Thus I follow both Dunne and Hughes (1994) and Kamshad (1994) and use the log of age with both a linear and a quadratic term.

The second potentially important variable is the size of the firm. Dunne and Hughes (1994) posit an inverse relationship between size and the probability of exit on the grounds that profits are likely to be subject to greater variance in smaller firms. In fact, they find that the relationship "is by no means a simple one" (p.122). Here, the log of tangible assets in 1991 is included to control for such size effects[41]. A positive coefficient on this variable would suggest that larger firms are less likely to exit than smaller firms.

A number of variables are experimented with to control for reverse causality. The first is the profit rate in 1991. Firms with low profitability are more likely to have subsequently gone into receivership. The same argument applies to the second

[41]As in the profitability regressions, other specifications of size were experimented with but made no difference to the central results.

variable - percentage change in profits between 1989 and 1991 - and the coefficient on both is expected to be negative. The last control variable is a dummy variable for firms who stated that they reduced advertising during the five years prior to the survey. If such firms may again be more likely subsequently to go into receivership, then a positive coefficient is to be expected. In the presence of these control variables, it seems reasonable to attribute a significant coefficient on advertising variables as evidence of a causative relationship going from advertising to the probability of firm exit.

5.4.3 Empirical Results

Table 5.7 presents simple correlations between firm exit and advertising intensity. Correlations are also shown between firm exit and a dummy for whether firms advertise or not. All correlations are negative, but quite small for the full sample. The magnitude is considerably greater both when the sample is restricted to firms operating chiefly in consumer markets and for the advertising dummy.

Results from the probit regressions are shown in Tables 5.8 and 5.9. In columns 1 and 2 of Table 5.8, the model is estimated without advertising effects. The firm size variable is negative and significant. Larger firms do seem less likely to go into receivership. Firm age is only significant when the effect is restricted to firms operating mainly in consumer markets. As expected the coefficient on the log of age is positive whilst that on the log of age squared is negative. In other words, age increases the probability of going into receivership only for particularly new firms.

Both the advertising variables are experimented with: advertising as a percentage of sales (in column 3) and a dummy variable equalling 1 if the firm advertises at all and 0 otherwise (in column 4). Both attract the expected, positive coefficient, but neither is significant at conventional levels.

In Table 5.9, column 1, the advertising dummy variable effect is restricted to consumer firms. The coefficient is now significant at the 5% level. Inclusion of a straightforward consumer dummy variable in column 2 improves the fit of the model, although the quadratic age term is rendered insignificant and omitted. In addition the coefficient on the advertiser dummy is increased both in absolute terms and in significance. For consumer firms at least, advertising seems to decrease the probability of going into receivership. The diagnostic statistic rejects the null hypothesis of homoscedastic error terms[42]. Thus, in column 3 of Table 5.9, standard errors robust for heteroscedasticity are estimated without altering any of the conclusions.

The 1991 profit rate is included in column 4. As expected, this attracts a negative coefficient and is strongly significant. Lagged profitability seems to be a good indicator of which firms can be expected to go into receivership. However, the advertising variable is still strongly significant and remains so with the inclusion of the two other control variables in column 5. The change in profits from 1989 to 1991

[42]The diagnostic statistics for the probit model are as described in Chapter Four.

attracts the expected negative coefficient[43]. The dummy for firms who reduced advertising in the five years prior to the survey attracts a positive coefficient that is not significantly greater than zero.

Probability Effects

The coefficients from Table 5.9, columns 3 - 5 are converted into probability effects in Table 5.10 These suggest that, when the lagged profitability controls are not included, consumer firms who advertise are about 7.5% less likely to go into receivership than those who do not advertise. When profitability is controlled for, the decrease in probability is closer to 6%.

As has been emphasised, the number of firms who went into receivership in the sample is quite low. As a consequence, these results should not be seen as definitive. They suggest that there is a link moving from advertising to firm profitability. This result is robust to controls for reverse causation. In any case, the scope for simultaneity bias is probably lower with this approach than with more traditional advertising-profitability studies. At the very least a case has been made for a larger scale investigation following the approach employed here.

5.5 CONCLUSIONS

Many econometric problems beset the investigation of the advertising-profits

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[43]The percentage change in profits between 1990 and 1992 was also experimented with. Although it had slightly more explanatory power than the 1989-1990 variable, it resulted in the loss of seven more observations due to missing data. In both cases, the advertiser coefficient remains negative and highly significant.

relationship. Among the most significant are those of data measurement, causation and heteroscedasticity. Rather than attempting to estimate a precise structural model (an approach which is likely to be ultimately unsatisfactory in any case), an attempt is taken here to draw robust generalisations from the cross-sectional data on UK firms. Four such generalisations can be drawn from the evidence presented in this chapter:

1. Advertising is correlated with firm level profitability for firms who act mainly in consumer goods industries.

2. The correlation is stronger when total advertising expenditure rather than advertising intensity is used, even when firm size is controlled for.

3. The correlation with future profitability is higher than that with lagged profitability.

4. Firms who advertise seem to be less likely to go into receivership than those who do not advertise.

These generalisations are robust to a barrage of checks and alternative approaches. In particular the accounting interpretation of the advertising-profitability association is comprehensively rejected. In the absence of convincing instruments, it is impossible to reject conclusively the possibility that causation may be going from firm performance to advertising. However, it is difficult to reject the hypothesis that advertising affects profitability given both the fact that the correlation between advertising and future profits seems stronger than that with past profits and, also, that it is stronger for total advertising expenditure. This last point is important as there is a stronger theoretical case for a causative relationship from total expenditure to profits

than for advertising intensity.

Perhaps the strongest evidence of all comes from the new approach to getting around the causation problem. That is, using firm exit due to receivership as an unambiguous measure of firm performance.

This chapter does not claim to have the final answer on the advertising-profits debate. There are some results which do not fit in with previous work and, as such, may be a cause for concern. Most notable is the lack of an observed correlation between industry share for the firm and profitability. In any case, the claims for a medium-sized, cross-section sample such as this must be limited. It does, however, provide a convincing challenge to those who claim that there is no effect on firm performance from advertising in the UK. It is difficult to envisage the challenge being taken up unless the accessibility of firm level data on advertising is improved. In the absence of official data being available, further attempts at collecting data from surveys of firms (perhaps coupled with more detailed case studies) seems the most hopeful approach).

Table 5.1: Raw Correlations between Advertising in 1992 and Profit Rates in 1991-3

		1991	1992	1993
All Firms	A/S	-0.0846 (.15)	0.0883 (.14)	0.0481 (.43)
	A	0.0216 (.71)	0.0529 (.37)	0.0898 (.13)
	N	293	285	277
Consumer Firms	A/S	0.0134 (.89)	0.1029 (.27)	0.0921 (.34)
	A	0.1150 (.21)	0.1513 (.10)	0.1908 (.04)
	N	117	115	111

Note:
Figures in brackets are significance levels.

Table 5.2: OLS Estimates of Determinants of Profit Rates in 1993

	(1)	(2)	(3)[1]	(4)[1]	(5)[1]
Assets/Sales 93	.0268***	.0273***	.0273***	.0324**	1.412
	(.0072)	(.0071)	(.0090)	(.0182)	(1.435)
A/S	.5081				
	(.3371)				
A/S* Consumer		.9601**	.9660**	.9346**	.9118***
		(.4255)	(.4199)	(.4342)	(.3830)
A/S* Non-consumer		-.0434			
		(.4631)			
Log(assets)				.1178	
				(.5147)	
Industry share				-.0099	
				(.0176)	
Import Intensity				.0168	
				(.0217)	
Ind Growth 90-92				.1076**	
				(.0498)	
Industry Dummies	No	No	No	No	Yes
Industry*Assets/Sales	No	No	No	No	Yes
Constant	3.656***	3.626***	3.593***	3.253*	-107.0*
	(1.023)	(1.097)	(.9570)	(1.853)	(57.05)
N	272	272	272	242	272
F Statistic	7.82***	6.25***	-	-	-
Adj R^2	0.0479	0.0549	0.0584	0.0711	0.1637
Diagnostics:					
Heteroscedasticity	10.94***	8.14***	-	-	-
Functional Form	0.37	0.59	-	-	-
Non-normality	3.34***	3.26***	-	-	-

Notes:
1. Dependent variable is (pre-tax profits/sales) in 1993.
2. Figures in brackets in (1) and (2) are standard errors. Figures in (3) - (5) are standard errors adjusted for heteroscedasticity.
3. * indicates significance at 10% level; ** at 5%; *** at 1%.

Table 5.3: Determinants of Profit Rates: long run effects

	(1)	(2)[1]	(3)[1]
Assets/Sales 93	.0131**	.0131*	.2346
	(.0057)	(.0076)	(1.092)
A/S * Consumer	.4427	.4427	.1866
	(.3120)	(.2815)	(.2689)
Profit Rate 92	.7261***	.7261***	.7374***
	(.0484)	(.0854)	(.0794)
Industry Dummies	No	No	Yes
Industry*Assets/Sales	No	No	Yes
Constant	1.149	1.149	42.75
	(.7275)	(.8340)	(43.93)
N	272	272	272
F Statistic	86.88***	-	-
Adj R^2	0.4883	0.4883	0.6193
Diagnostics:			
Heteroscedasticity	82.53***	-	-
Functional Form	3.46**	-	-
Non-normality	1.64	-	-

Notes:
See Table 5.2

Table 5.4: Determinants of Profit Rates: advertising intensity versus total advertising

	(1)	(2)	(3)[1]	(4)[1]	(5)[1]
Assets/Sales 93	.0248***	.0254***	.0254***	1.412	.0131*
	(.0075)	(.0074)	(.0090)	(1.435)	(.0076)
A/S	.4686				
	(.3513)				
A	.0668				
	(.0637)				
A/S * Consumer		.7685*	.7685	.6044	.0226
		(.4494)	(.4671)	(.3740)	(.2831)
A * Consumer		.0931	.0931***	.1040***	.0565**
		(.0784)	(.0313)	(.032-04)	(.0225)
Log(assets)	.3902	.3518	.3518		
	(.4102)	(.3915)	(.4330)		
Profit Rate 92					.7345***
					(.0795)
Industry Dummies	No	No	No	Yes	Yes
Industry*Ass/Sales	No	No	No	Yes	Yes
Constant	.2.474	2.665*	2.665***	-107.00	43.01
	(1.565)	(1.442)	(.8997)	(57.05)	(43.97)
N	272	272	272	272	272
F Statistic	4.63***	5.56***	-	-	-
Adj R^2	0.0509	0.0605	0.0605	0.1665	0.6194
Diagnostics:					
Heteroscedasticity	2.99*	2.49	-	-	-
Functional Form	0.31	0.89	-	-	-
Non-normality	2.32**	2.33**	-	-	

Notes:
See Table 5.2.

Table 5.5a: Determinants of Profit Rates: $\lambda = 0.5$

	(1)	(2)	(3)	(4)
Adj Assets/Sales	.0276***	.0275***	.0131*	.0131*
	(.0090)	(.0090)	(.0076)	(.0076)
A/S * Consumer	1.010**	.7986*	.4521	.3898
	(.4411)	(.4692)	(.2769)	(.3214)
A * Consumer		.0982***		.0287
		(.0323)		(.0230)
Profit Rate 92			.7274***	.7254***
			(.0843)	(.0849)
Constant	3.451***	3.487***	1.100	1.117
	(.9120)	(.9132)	(.8319)	(.8322)
N	272	272	272	272
Adj R2	0.0609	0.0630	0.4934	0.4920

Notes:
1. Dependent variable is (pre-tax profits)/sales in 1993, adjusted as in the text.
2. Figures in brackets are standard errors, robust to heteroscedasticity.
3. For other notes see Table 5.2.

Table 5.5b: Determinants of Profit Rates: $\lambda = 0.7$

	(1)	(2)	(3)	(4)
Adj Assets/Sales	.0274***	.0274***	.0131*	.0131*
	(.0090)	(.0090)	(.0076)	(.0076)
A/S * Consumer	.9978**	.7901*	.4478	.3862
	(.4309)	(.4696)	(.2821)	(.3199)
A * Consumer		.1011***		.0296
		(.0315)		(.0230)
Profit Rate 92			.7261***	.7240***
			(.0852)	(.0858)
Constant	3.560***	3.599***	1.140	1.161
	(.9036)	(.9045)	(.8279)	(.8394)
N	272	272	272	272
Adj R2	0.0599	0.0623	0.4898	0.4884

Notes:
See Table 5.5a

Table 5.5c: Determinants of Profit Rates: $\lambda = 0.9$

	(1)	(2)	(3)	(4)
Adj Assets/Sales	.0273***	.0273	.0131*	.0131*
	(.0090)	(.0090)	(.0076)	(.0076)
A/S * Consumer	.9668***	.7589	.4379	.3813
	(.4356)	(.4701)	(.2810)	(.3198)
A * Consumer		.1030***		.0302
		(.0313)		(.0231)
Profit Rate 92			.7261***	.7239***
			(.0854)	(.0860)
Constant	3.590***	3.631	1.149	1.173
	(.8962)	(.8988)	(.8302)	(.8422)
N	272	272	272	272
Adj R2	0.0588	0.0615	0.4886	0.4872

Notes:
See Table 5.5a.

Table 5.6: Determinants of Profit Rates (gross profits)

	(1)	(2)	(3)	(4)
Assets/Sales 93	.0593***	.0636***	.0565**	.0460***
	(.0102)	(.0103)	(.0231)	(.0127)
A/S * Consumer	1.386*	.6273	.7355	.1580
	(.7039)	(.5651)	(.5342)	(.5412)
A/S * Non-consumer	.9693			
	(.8050)			
A * Consumer		.2750***	.2590***	.2370***
		(.0543)	(.0508)	(.0651)
Log(assets)		-1.167*	-1.700**	-1.135**
		(.6808)	(.8522)	(.5761)
Industry Share			.0596	
			(.5826)	
Import Intensity			.0356	
			(.0740)	
Industry Growth 90-92			.1606*	
			(.0858)	
Profit Rate 92				.2501**
				(.1224)
Constant	22.59***	22.67***	27.98***	22.30***
	(1.594)	(2.406)	(2.746)	(3.276)
N	202	202	186	202
Adj R2	0.1055	0.1241	.0761	.2603

Notes:
1. Dependent variable is (gross profit/sales) in 1993.
2. Figures in brackets are White standard errors, robust to heteroscedasticity.
3. * indicates significance at 10% level, ** at 5%; *** at 1%.

Table 5.7: Raw Correlations between Firm Exit and Advertising

	All Firms	Consumer Firms
A/S	-0.0569	-0.1404
	(.32)	(.12)
N	301	121
Advertising Dummy	-0.0881	-0.2816
	(.11)	(.00)
N	324	131

Note:
Figures in brackets are significance levels.

Table 5.8: Probit Estimates of Firm Exit I

	(1)	(2)	(3)	(4)
Log(age)	-.2502			
	(.6010)			
[Log(age)]^2	.0299			
	(.1023)			
Log(age)*Consumer		.7657**	.8341***	.7651***
		(.3091)	(.3204)	(.3133)
[Log(age)]^2*Consumer		-.2048**	-.2160**	-.2048**
		(.0821)	(.0848)	(.0835)
Log(assets)	-.1390**	-.1536***	-.1395**	-.1503***
	(.0554)	(.0576)	(.0631)	(.0582)
A/S			-.0983	
			(.0711)	
Advertiser				-.3275
				(.2576)
Constant	-.7709	-1.267***	-1.2111***	-1.039***
	(.8450)	(.1887)	(.2184)	(.2566)
Mean Dep Vble	0.059	0.059	0.060	0.059
N	324	324	301	324
Log Likelihood	-68.63	-65.52	-61.66	-64.74
Pseudo R2	0.0511	0.0940	0.0953	0.1049
Diagnostics:				
Functional Form	9.57**	10.39**	3.38	3.42
Heteroscedasticity	3.08	4.02	23.17	15.02
Non-normality	3.94	0.20	0.43	0.01

Notes:
1. Dependent variable is Exit: = 1 if the firm went into receivership between 1992 and 1995.
2. Figures in brackets are standard errors.
3. * indicates significance at 10% level; ** at 5%; *** at 1%.

Table 5.9: Probit Estimates of Firm Exit II

	(1)	(2)	(3)[1]	(4)[1]	(5)[1]
Log(age)*Consumer	1.219***	-.4475**	-.4475***	-.6543***	-.6721***
	(.4201)	(.1785)	(.1628)	(.2095)	(.2151)
[Log(age)]^2*Consum	-.2831***				
	(.1000)				
Log(assets)	-.1396**	-.1557***	-.1557***	-.0835	-.0715
	(.0590)	(.0600)	(.0555)	(.0619)	(.0667)
Advertiser*Consumer	-.8527**	-1.141***	-1.141***	-1.412***	-1.489***
	(.3960)	(.4214)	(.4072)	(.4810)	(.5059)
Advertiser*Non-cons	.0407				
	(.3449)				
Consumer		2.359***	2.359***	3.080***	3.185***
		(.6838)	(.6542)	(.8000)	(.8270)
Profit Rate 91				-.0263***	-.0263***
				(.0059)	(.0083)
% Change Prof 90-91					-.0045***
					(.0017)
Decrease Adv 87-92					.1249
					(.3761)
Constant	-1.309***	-1.279***	-1.279***	-1.638***	-1.689***
	(.3219)	(.1907)	(.1741)	(.1899)	(.1901)
Mean Dep Variable	0.059	0.059	0.059	0.048	0.048
N	324	324	324	316	316
Log Likelihood	-63.14	-61.97	-61.97	-41.24	-24.28
Pseudo R2	0.1270	0.1431	0.1431	0.3168	0.4591
Diagnostics:					
Functional Form	0.224	1.99	-	-	-
Heteroscedasticity	7.96	8.39	-	-	-
Non-normality	0.02	0.31	-	-	-

Notes:

1. Figures in brackets in (1) and (2) are standard errors. Figures in brackets in (3) - (5) are standard errors adjusted for heteroscedasticity.
2. For other notes see Table 5.8.

Table 5.10: Increases in Probability of Exit

	Column 3	Column 4	Column 5
Log(age)*Consumer	-3.63	-3.28	-1.30
Log(assets)	-1.26	-.419	-.290
Advertiser*Consumer[d]	-7.51	-5.86	-2.74
Consumer[d]	35.9	42.3	39.9
Profit Rate 1991		-11.4	-3.67
Change Profit Rate 90-92			-.069
Decrease Advertising 87-92[d]			0.52

Notes:
1. Probabilities are estimated from Table 5.8, columns 3 - 5.
2. For continuous variables, figures represent rates of change of probabilities.
3. For dummy variables (indicated by d), figures represent the increase in probability for cases where the variable = 1 over cases where the variable = 0.

Chapter 6

DURABILITY OF ADVERTISING

6.1 INTRODUCTION

There are several intuitive reasons for believing that advertising may have an effect which lasts longer than the current period. Firstly, there may be a time lag between receiving an advertising message and the decision to buy a good. This is particularly likely in the case of durable goods, such as cars, videos and so on. An advertising message may create a desire to own the good. However, before this can be converted into actual demand, the money may have to be made available whether by building up savings or arranging a loan.

There may also be a delay between the advertising expenditure and its reception by potential consumers. Magazines in doctors' waiting rooms and advertisements on rental videos provide obvious examples.

Lastly, the impact may be delayed due to a 'multiplier effect' whereby consumers who have not received the original advertisement are nevertheless encouraged to imitate the purchases of acquaintances who have done so.

If advertising does have effects beyond a single time period, then it is appropriate to treat it as an investment in a stock of intangible capital. As discussed in Chapter 5, if advertising is treated instead as a current expense, then estimates of its effect on profitability will be biased. The extent of this bias will depend on the durability of

the effects of advertising. Both Bloch (1974) and Ayanian (1975) demonstrate that if a low enough depreciation rate is used, the well-established correlation between advertising and profit rates disappears.

The most common approach to measuring the durability of advertising has been to use a Koyck lag model. Early work along such lines was surveyed by Clarke (1976) who concluded that the majority of advertising effects were dissipated within a year or less, a finding backed up more recently by Holstius (1990). Somewhat longer effects have been found by authors (such as Hirschey and Wegandt, 1985) who have attempted to look directly at whether advertising creates intangible capital. Dekimpe and Hanssens (1995) use unit root tests on the evolution of sales and also find a long term impact of advertising.

Recently it has been argued (see Thomas, 1989; Landes and Rosenfield, 1994) that the majority of such studies have tended to ignore important firm-specific factors that may have biased results. In particular, Landes and Rosenfield focus on product quality which, they argue, is "likely to be positively correlated with both sales and the productivity of advertising" (p.265). As a consequence, previous estimates are likely to have overestimated the lifespan of the effects of advertising.

As product quality is unobservable, they control for all firm-specific effects by including dummy variables for each firm in their pooled model. Using unbalanced panel data for 417 firms from the USA, they find that both the above-mentioned approaches do indeed overestimate the life of advertising effects unless the firm

effects are included. They further find that the steady-state assumption, central to the direct, intangible assets approach, cannot be justified by their data. When the bias is allowed for, Landes and Rosenfield find depreciation rates in excess of 50% for 15 out of the 20 industries studied, a result that is in line with the annual depreciation rate of above 80% found by Thomas (1989).

There are two main problems with the Landes and Rosenfield study. The first is that the least squares dummy variable (LSDV) estimator is likely to be biased and inconsistent in dynamic panel data models. The second problem is to do with their assumption that firm-specific effects can be put down to product quality. In particularly, if advertising is fairly stable over time for any particular firm, then it may itself make up a large part of the fixed effect. In this chapter, the survey data is used to replicate the Landes and Rosenfield result and to investigate the direction and magnitude of the estimation bias. The extent to which the fixed effects can then be assigned to advertising is then explored. Data limitation means that the sample of firms is much lower than in the Landes and Rosenfield study. However, other data in the survey also allows some insight into the possibility that depreciation rates may vary across different advertising media used by firms.

The rest of the chapter proceeds as follows. Section 6.2 provides a simple model of advertising depreciation. In section 6.3, the data is introduced and the econometric issues discussed. Estimation results are presented in 6.4 and some concluding comments are made in section 6.5.

6.2 THE SALES AND ADVERTISING RELATIONSHIP

Following Thomas (1989), the relationship between sales and advertising can be modelled very simply as:

$$Q_{it} = f(S_{it}, R_{-it}) \tag{6.1}$$

where Q_{it} represents sales for firm i in time t.

S_{it} is the stock of own advertising for firm i.

R_{-it} is the stock of advertising for rival firms.[44]

and where the advertising stocks depreciate at a rate λ.

Changes in the advertising stocks are related to current own advertising, A_{it}, and current rival advertising, K_{-it}, as follows:

$$dS_{it} = g(A_{it}) - \lambda.S_{it-1} \tag{6.2}$$

$$dR_{-it} = h(K_{-it}) - \lambda.R_{-it} \tag{6.3}$$

Using a Koyck transformation, 6.1 can be written:

$$Q_{it} = a_0 + a_1.g(A_{it}) + a_2.h(K_{it}) + (1 - \lambda).Q_{it-1} \tag{6.4}$$

Two potential problems suggest themselves at this stage. The first is simultaneity and in particular, the problem of the response of advertising to sales. Kwoka (1993) uses a Hausman test[45] and finds no evidence for this reverse relationship and also notes

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[44]An alternative specification (although one not common in the advertising depreciation literature) is to construct a Cobb-Douglas type production function by including capital and employment. The effects of including these variables are considered in section 6.4 below.

[45]It is not clear, however, what instrumental variables are used in this procedure.

that, in other work, "results have tended not to be sensitive to specification" (p.652). Thomas (1989) provides a more extensive discussion of the issue.

The second problem is the lack of data on rival advertising. An increase in rival advertising may have opposing effects. Market share is likely to be reduced, but, at the same time, total industry sales may increase. The overall effect on actual sales may be zero, but there is no guarantee of this. Thus, this is a potential source of bias. Some evidence is available from the survey on the expected reactions of firms to changes in rival advertising and this is used to test for the presence of such omitted variable bias below.

6.3 DATA AND ECONOMETRIC SPECIFICATION

6.3.1 Data

The data set consists of an unbalanced panel of firms with advertising data available for up to nine years. Analysis is restricted to those firms for which data on advertising expenditures and sales are available for two or more years. This leaves a total of 505 observation points. Table 6.1 illustrates both the number of observation points and the mean advertising level for each year. There is a good deal of variation in both sales and advertising from year to year with a particular jump in both between 1991 and 1992. This may reflect the start of an upturn out of the recession.

6.3.2 Econometric Specification

The model to be estimated is as follows:

$$Q_{it} = \alpha_0 + \alpha_1 A_{it} + \beta Q_{it-1} + v_i + w_t + \epsilon_{it} \qquad (6.5)$$

where v_i is the firm-specific residual.

w_t is the year-specific residual.

ϵ_{it} is the remaining residual.

and where the annual depreciation rate, d, is calculated from the estimate of β as $d = 1 - e^{(1-1/\beta)}$ (see Rao, 1986, p.130).

The year-specific residual, w_t, is captured by including dummy variables for each of the years 1985 to 1991. Several estimators of the model are considered. The first is the random effects estimator which uses generalised least squares. This estimator requires the assumption that the firm-specific effects are not correlated with the mean (over time) of the other dependent variables[46]. As Landes and Rosenfield do not estimate a random effects model, OLS estimates of equation (6.4) are also reported. It should be noted that direct OLS is only appropriate if the variance of the fixed effects are zero. As this is unlikely to be the case, the random effects estimator is preferable.

A further problem with both the OLS and random effects estimator, and one not

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[46]Formally (and ignoring the time specific effects), the random effects estimator is estimated as:

$$Q_{it} - \theta\bar{Q}_i = \alpha_0.(1 - \theta) + \alpha_1.(A_{it} - \theta\bar{A}_i) + \beta.(Q_{it} - \theta\bar{Q}_{it}) + [(1 - \theta)v_i + w_t + (\epsilon_{it} - \theta\bar{\epsilon}_i)]$$

where $\theta_i = 1 - \sqrt{\dfrac{\sigma_\epsilon^2}{T_i\sigma_v^2 + \sigma_\epsilon^2}}$

where T_i is the number of years of data on firm i and σ^2 are variances.

considered by Landes and Rosenfield, is that Q_{it-1} is correlated with Q_{it} and thus with the error term, v_i. This provides a source of bias to both estimators.

An alternative estimator is that which allows for fixed effects. The LSDV approach estimates equation (6.4) with firm dummy variables. This specification does not require the above assumption of no correlation and allows for firm-specific effects such as product quality in the Landes and Rosenfield model. This estimator eliminates the bias due to correlation with the v_i error term. However, some bias remains as the residual error, ϵ_{it}, will still be correlated with the lagged dependent variable (see Baltagi 1995, p.126).

A consistent estimator can be found by transforming (6.4) to first differences and using an instrument for the first difference of the lagged dependent variable:

$$(Q_{it} - Q_{it-1}) = \alpha_1(A_{it} - A_{it-1}) + \beta(Q_{it-1} - Q_{it-1}) + (w_t - w_{t-1}) + (\epsilon_{it} - \epsilon_{it-1}) \quad (6.6)$$

There are several consistent instruments available. Anderson and Hsiao (1981) suggest using $(Q_{it-2} - Q_{it-3})$ or simply Q_{it-2}. Baltagi (1995) argues that the latter estimator will lead to more efficient estimates. Arellano and Bond (1991) suggest that, in the absence of serial correlation, an even more efficient estimator can be found by using the interactions between Q_{it-2} and respective year dummies as a set of instruments.

6.4 ESTIMATION RESULTS

6.4.1 Basic Model

Table 6.2 reports estimates of the OLS, random effects and LSDV versions of

equation (6.5). In all regressions, dummy variables for years 1985 to 1991 are included. Columns 1 and 2 report the OLS and random effects estimators respectively (that is, without the firm-specific effects in both cases). The estimated annual advertising depreciation rate is 8.2% using the OLS estimator and 9.1% under random effects, implying that the effects of advertising are extremely durable. The figures also suggest little difference between the two estimators. This is confirmed by a Lagrange Multiplier test (see Greene, 1993, p.478) for random effects, which cannot reject the null hypothesis that variance of the fixed effects is zero ($\chi^2(1) = 0.91$).

In column 3, the LSDV results are reported. Under this specification, the sales-advertising relationship is modelled net of permanent firm effects. The coefficient on advertising is greatly reduced, whilst that on lagged sales increases. Both are still significant at the 1% level. There seems to be clear evidence of a difference between the two specifications. Formally, a Hausman specification test rejects the null hypothesis that the two sets of coefficients are equal at the 1% level ($\chi^2(10) = 166.26$). The implied depreciation rate now rises to 96.8%. Thus, there is clear evidence in support of the Landes and Rosenfield (1994) result: the estimated durability of advertising is reduced (essentially to one time period) once firm-specific factors are allowed for.

In order to check to the direction and magnitude of the bias on these results, equation (6.5) is now estimated using the Arellano-Bond set of instruments (the interactions between Q_{it-2} and the year dummies) discussed above. Due to the use of a minimum of second period lags as instruments, the sample size is reduced to 386. Sargan tests

of instrument validity suggest that the optimal set of instruments includes sales lagged up to four periods. Results using these instruments are reported in Table 6.3.[47]

To ensure the results are not sensitive to the dropped observations, column 1 gives the LSDV estimates of (6.4) on the smaller sample. There are no major differences to the full sample estimates. Column 2 shows the instrumental variables estimates along with standard errors which are robust to heteroscedasticity. Consequently, the significance of both key variables is reduced. The point estimates of the coefficient on lagged sales decreases to 0.26 and the implied depreciation is still extremely high at 94%. The use of Q_{it-2} in the set of instruments will lead to consistent estimates only if there is no serial correlation. This would be apparent as second order autocorrelation in the first differenced model. In fact, there is no evidence of such autocorrelation either here or in any of the subsequent regressions.[48]

One important issue is the sensitivity of the results to the unbalanced panel. Arellano and Bond (1991) argue that in this situation "... nothing fundamental changes in the econometric methods provided a minimum number of continuous time periods are available on each unit..." (p.281). Hence, the model is re-estimated omitting firms with less than four continuous observations. This reduces the sample size to 323. Estimation results of equation (6.5) on this sample is reported in column 1 of Table

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[47]The Sargan test is of the null hypothesis that the instruments are valid. It is distributed as $\chi^2(r)$ where r is the number of overidentifying restrictions, in this case 25.

[48]The tests for serial correlation are distributed asymptotically as N(0,1) under the null hypothesis of no autocorrelation. Details of both this test and the Sargan test for instrument validity can be found in Arellano and Bond (1991).

6.4. The coefficients on lagged sales and current advertising increase only marginally, suggesting that there is little evidence of bias from using the unbalanced panel.[49]

Two further experiments check for bias from omitted variables. The first is to include log functions of employment and capital. This transforms the model to a typical Cobb-Douglas production function. In line with the transformation in 6.5, first differences of both variables are used. The coefficients on both are positive (as expected) but only that on employment is significant at the 5% level. In this case the coefficient on lagged sales decreases markedly and is very close to zero. The new value of the coefficient does not, however, change the economic implication that advertising effects are dissipated within the current year.

The second experiment is to investigate bias due to the omission of rival advertising. This is done by restricting the sample to firms who state that they would not respond either to a decrease or an increase in advertising by rivals. Results are reported in column 3 of Table 6.4. There are very clear differences with this sample. Although the coefficient on lagged sales is comparable to previous estimates, that on current advertising is now less than zero, albeit insignificantly so. This implies there may be a bias from omitting rival advertising and results both here and elsewhere need to be interpreted with caution.[50]

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[49]The trend of both coefficients increasing continues if the sample is restricted to even longer time series. However, the estimated depreciation is always over 85%.

[50]In the case of both these experiments, there is little impact on the estimates from restricting the sample to firms with longer time series.

That last point aside, the general result that the depreciation rate of current advertising is extremely high seems to be robust. Consequently, and also in order to maximise the sample size, the rest of the chapter reverts to developing the LSDV estimates of equation (6.4).

6.4.2 Durability by Industry

The picture above is confirmed by the results reported in Table 6.5. Here, the models are re-estimated allowing the coefficients to vary across 2-digit industries. Industries with less than three firms are excluded leaving a sample of 383 observation points in 16 broad industries.

The random effects specification is reported in the first half of the table. The estimated value of Θ in this instance is zero, suggesting that OLS estimation (as used in Landes and Rosenfield) may be appropriate. In this case the estimated depreciation rate is less than 30% in all but three of the industries - "Metal Manufactures", "Oil and Gas" and "Rubber and Plastics Processing". For the last two of these, the coefficient on lagged sales is not significant. The current advertising coefficient is significant only for the "Other Manufacturing" industries.

The LSDV model (reported in the second half of the table) leads to greatly lower coefficients on lagged sales in every case. The implied depreciation rates are increased for all but one of the industries, the exception being mineral extraction. This pattern is broadly the same for producer and consumer based industries and for both manufacturing and services. The coefficient on current advertising increases in

eight of the industries, although it is only significant at the 5% level in three of these - "Electrical and Electronic Engineering", "Food, Drink and Tobacco" and "Printers, Paper and Publishing". Once again, when firm fixed effects are allowed for, the estimated depreciation rate of advertising increases dramatically[51].

The similarity of these results to Landes and Rosenfield (1994) is reassuring for a number of reasons. In the first case, it suggests that the survey data used here is comparable to official statistics. Secondly, (and also in the light of the robustness experiments in 6.4.1) the reduced sample size and unbalanced panel do not in themselves seem to have introduced any major biases.

6.4.3 Durability by Advertising Media

Given the well-known difficulties both in classifying industries and in imposing such classifications on firms operating in several product areas, a more satisfactory distinction is the medium of advertising used. For example, Tellis and Weiss (1995) report findings that, although advertising as a whole increases sales, television advertising alone seems to have no significant effect. Thus, dummy variables are constructed for the eight media on which at least some firms state that they spend the largest amount of their advertising budget. The advertising and lagged sales effects are allowed to vary across each of these media. The LSDV model only is reported in Table 6.6.

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[51]The Hausman test rejects the hypothesis that the two sets of coefficients are equal at all levels of significance, $\chi^2(40) = 273.0$.

Once again the Landes-Rosenfield result is broadly confirmed. In the LSDV model, depreciation is over 95% in all but 2 of the media. The exceptions are Direct Mail and Directories (such as Yellow Pages) of which only the latter is significant. Thus, only in media which are clearly durable are there advertising effects which last much longer than one year.

6.4.4 Variation over Time

The last experiment is to control for depreciation across different years. It is by no means clear that the depreciation rate of advertising should be constant over time and, in particular, over the business cycle. Consequently, the last experiment is to test the robustness of the result across the different years in the survey. Results are reported for the LSDV model in Table 6.7.

In eight out of the nine years, the depreciation rate is over 98%. The only exception is 1988 where it dips to 91.9%. It is certainly plausible that the onset of the recession in that year may have meant that consumer decisions are delayed, thus increasing the lifespan of advertising. However, the drop is neither prolonged nor of great enough magnitude to contradict the previous results.

6.4.5 Analysis of Fixed Effects

It is clear that firm-specific effects reduce the observed durability of advertising. Landes and Rosenfield (1994) attribute the fixed effects to product quality. It is equally plausible, however, that advertising plays a large part in contributing to these fixed effects. Here, this hypothesis is tested by retrieving the fixed effects from

Tables 6.1 and analysing their determinants. This is a similar procedure to that employed by Geroski and Pomroy (1990) in an analysis of changes in concentration over time.

The methodology is to regress the fixed effect ($Fixed_i$) for firm i on various firm-specific factors: the mean level of log of advertising over the time period; the mean of the log of tangible assets (to control for size effects); indicator variables for whether the firm operates mainly in producer or consumer goods industries. The model is thus:

$$Fixed_i = \alpha_0 + \alpha_1 \log(A)_i + \alpha_2 \log(Assets)_i + \alpha_3 consumer_i + \alpha_4 producer_i + u_i \quad (6.9)$$

Table 6.8 presents the results of OLS estimation of this model. In the first column, the impact of the log of advertising is considered on its own. The coefficient is positive and significant. However, a Ramsey reset test rejects the null hypothesis of no missing variables. Thus, in column 2, a quadratic advertising term is included. This attracts a positive and highly significant coefficient and improves the explanatory power of the model. In other words, advertising seems to play at least some part in explaining the firm fixed effects.

In column 3, dummy variables for the importance of quality[52], consumer and producer firms are included as well as the log of tangible assets. The latter proves to

[52]This variable equals 1 if the firm states that quality is an important form of competition in their market(s). See Appendix 1 for a precise definition.

be highly significant and greatly reduces the impact of the advertising variables. Of the dummy variables, only that for producer firms has a significant (positive) coefficient. The importance of quality seems to play no part in the firm fixed effects. Column 4 reports the more parsimonious model which is left after removing variables not significant at the 10% level. The quadratic advertising term is once again highly significant, albeit still of a lower magnitude than in columns 1 and 2.

Table 6.9 summarises the key results of the analysis of the fixed effects in the models where advertising effects are allowed to vary with industry, advertising media and year respectively.

In the case of the 'industry' model the consumer and producer dummies are omitted. As a Cook-Weisberg test rejects the null hypothesis of homoscedasticity, adjusted standard errors are reported[53]. Due to the omission of industries with less than three firms, the sample size is reduced to 81 and the mean fixed effect is somewhat higher than in the basic model. In this case, both the advertising coefficients are strongly significant, even though the size variable is included.

In the media and year models, the mean fixed effect, and consequently the coefficients, are greatly reduced. In the media model, only the linear advertising effect is significantly positive, whilst in the year model, only the quadratic term is significant. In no case is the coefficient on the quality dummy ever significant at the 10% level and in the first two columns it is actually negative.

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[53]See Chapter Four for a description of the diagnostic tests.

6.5 CONCLUSIONS

This chapter has investigated some of the dynamics of the advertising-sales relationship. In contrast to the other empirical sections of the thesis, it has drawn on panel data which is held for a restricted sample of firms.

Once firm-specific effects are controlled for, the measured effect of advertising on sales seems to be restricted to one year or less. This result is robust to charges of bias due to correlation between the lagged dependent variable and the error terms, to the omission of firms with particularly short time series and to the inclusion of variables to control for capital and employment.

When advertising effects are allowed to vary across 16 SIC two-digit industries, effects which last longer than one year are only found in six industries and are significant in only two of these. In addition similar results are found when effects are allowed to vary across different advertising media and with time. Only in the case of advertising via direct mail and directories are durable effects of advertising found.

Previous authors have attributed this result to product quality which gives firms an incentive to have high levels of advertising. This chapter has questioned that interpretation by extracting the fixed effects and exploring their determinants. Advertising seems to be have a positive and significant impact which is robust to the inclusion of other explanatory variables. The importance of product quality in the firm's market has no impact on the fixed effects. To the extent that this acts as a proxy for firm product quality, this suggests that the Landes and Rosenfield (1994)

interpretation of their results is flawed. As advertising is likely to be fairly persistent over time, the conclusion that it plays a large part in firm fixed effects should not be surprising.

These results also shed some light on the interpretation of the findings in Chapter Five based on cross-sectional data. Advertising is fairly stable over time within firms. This leads to a permanent effect on sales (as shown in this chapter by the analysis of fixed effects) and on profitability (as demonstrated in Chapter Five). Increases in advertising do lead to increases in sales, but this effect is essentially a short run one. In turn, this suggests that an assumption of very low advertising depreciation rates is not appropriate when modelling the advertising-profitability relationship.

Table 6.1: Mean Advertising and Sales by Year

Year	Number of Firms	Mean Level of Advertising (£m)	Mean Sales (£m)
1992	95	3.529	1047.8
1991	104	2.340	760.9
1990	77	2.461	826.5
1989	66	2.589	840.0
1988	50	2.459	934.4
1987	38	2.811	1219.0
1986	30	3.562	1896.3
1985	26	1.464	1538.1
1984	19	1.117	851.2

Note:
Figures excludes observations for which either advertising or sales equals zero.

Table 6.2: Long Run Effects of Advertising on Sales

	(1) OLS	(2) Random Effects	(3) LSDV
Log (Advertising)	.0596***	.0657***	.2724***
	(.0139)	(.0147)	(.0351)
Log (Sales)$_{t-1}$	.9213***	.9127***	.2257***
	(.0168)	(.0179)	(.0609)
Constant	.5696**	.5696	3.511***
	(.1385)	(.1385)	(.2634)
Implied Depreciation	8.2%	9.1%	96.8%
Year Effects	Yes	Yes	Yes
Industry Effects	No	No	No
SD(v_i)	-	.0894	1.197
θ	-	.0590	-
N x T	505	505	505
F Statistic	516.16***	-	61.5***
Adj R^2	0.9109	-	-
Within R^2	-	.1446	.2692
Overall R^2	-	.9126	.6971

Notes:

1. The dependent variable is log(sales).
2. Depreciation is calculated as $1 - e^{(1 - 1/\beta)}$ where β is the regression coefficient on lagged sales (See Rao, 1986).
3. Figures in brackets are standard errors.
4. *** indicates significance at the 1% level, ** at the 5%, * at the 10%.

Table 6.3: Long Run Effects of Advertising on Sales: IV estimation

	(1) LSDV (Levels)	(2) IV (1st Differences)
Log (Advertising)	.3385*** (.143)	.2458* (.1516)
Log (Sales)$_{t-1}$	.2041*** (.0756)	.2257 (.1733)
Constant	3.935*** (.329)	.0203 (.2038)
Implied Depreciation	98.0%	96.8%
Year Effects	Yes	Yes
Industry Effects	No	No
N x T	386	386
Sargan Test	-	33.99
1st Order Serial Correlation	-	-1.768*
2nd Order Serial Correlation	-	-0.219

Notes:
1. The dependent variable is log(Sales) in column 1 and first difference of log(Sales) in 2.
2. In column 2, the lagged dependent variable is instrumented by lags up to and including the fourth period.
3. Figures in brackets in column 2 are standard errors robust to heteroscedasticity.
4. For other notes see Table 6.2.

Table 6.4: Long Run Effects of Advertising on Sales: robustness experiments

	(1) Firms with 4 or more years of data	(2) With employment and assets	(3) No rival reaction
Log (Advertising)	.3287*	.2587	-.0138
	(.1892)	(.1648)	(.0417)
Log (Sales)$_{t-1}$	.2766	.0209	.2106
	(.2707)	(.1353)	(.1672)
Log (Employment)	-	.1354**	-
		(.0557)	
Log (Assets)	-	.0464	-
		(.0562)	
Constant	.0530	-.0058	-.0226
	(.2106)	(.2092)	(.2902)
Implied Depreciation	92.7%	100%	97.6%
Year Effects	Yes	Yes	Yes
Industry Effects	No	No	No
N x T	323	347	233
Sargan Test	34.10	25.66	35.64*
1st Order Serial Corr	-1.840*	-1.592	-1.717*
2nd Order Serial Corr	-0.132	.512	-.682

Notes:

1. Log(Sales$_{t-1}$) is instrumented by log(Sales$_{t-2}$) interacted with the year effects.
3. Figures in brackets are standard errors robust to heteroscedasticity.
2. For other notes see Table 6.3.

Table 6.5: Long Run Effects by Industry

Industry	Random Effects			LSDV		
	Advert * Industry	Sales (-1) * Industry	Deprec	Advert* Industry	Sales(-1) *Ind	Deprec
Oil/Gas	-.0546	.3740	81.2	-.0384	.6192	45.9
	(.1132)	(.5551)		(.2759)	(.5316)	
Metals	.1631	.6361***	43.6	.0421	-.1546	100
	(.1157)	(.1400)		(.1023)	(.1793)	
Mineral Extraction	-.2127	1.177***	0	-.1990	1.113	0
	(.3491)	(.1812)		(.4080)	(.8190)	
Chemicals	.0851	.9211***	8.2	.0817	.4726	67.2
	(.0725)	(.1142)		(.2759)	(.5708)	
Metal Goods	.0950	.7549***	27.7	-.0042	-.1685	100
	(.0893)	(.1233)		(.1895)	(.2311)	
Mech Eng	.0251	.9718***	2.9	.0637	-.1744	100
	(.0418)	(.0386)		(.1020)	(.4328)	
Elec Eng	.0318	.9387***	6.3	.0503	.4651**	68.3
	(.0605)	(.0869)		(.1325)	(.2104)	
Food/drink	-.0283	.8798***	12.8	-.1260	.3112***	89.1
	(.0551)	(.0556)		(.1311)	(.1122)	
Textiles	.0359	.9753***	2.5	.2112	.2458	95.4
	(.0566)	(.0582)		(.2112)	(.1702)	
Printers	.0261	.9907***	0.9	-.0083	.7497**	28.4
	(.0890)	(.1989)		(.1076)	(.3220)	
Rubber/plastics	.3507	.1451	99.7	.2501	.1240	99.9
	(.2746)	(.2948)		(.2188)	(.2350)	
Other Manufact	.4877***	3.0849***	0	.9757***	.8308	18.4
	(.1030)	(.4676)		(.1181)	(.5595)	
Construction	-.0783	.7541***	27.8	.3619***	.0636	100
	(.0621)	(.0690)		(.1400)	(.1165)	
Wholesale Dist	.0603	.8742***	13.4	-.0089	.1046	100
	(.0640)	(.1077)		(.1155)	(.1845)	
Retail Dist	.0370	.9543***	4.7	.0657	-.1677	100
	(.1025)	(.1417)		(.1161)	(.6313)	
Business Serv	.1094	.7863***	23.8	.1665	-.0477	100
	(.0531)	(.0923)		(.1381)	(.2130)	
Constant	-213.0			610.6		
	(775.9)			(1489)		
Year Effects	Yes			Yes		
Ind Effects	Yes			Dropped		
θ	0			-		
SD (v_i)	0			2.912		
N x T	383			383		
F Statistic	54.08***			9.98***		
Within R^2	.4142			.6038		
Overall R^2	.9376			.0423		

Notes:
See Table 6.2

Table 6.6: Long Run Effects by Advertising Media

	LSDV		
Media	**Advert*Media**	**Sales(-1)*Media**	**Depreciation**
TV	.0351	.2796**	92.4
	(.0848)	(.1188)	
Radio	-.0536	-.2609	100
	(.7275)	(.7761)	
Poster	.4209	.2422	95.6
	(.8117)	(1.368)	
National Press	.0288	.2297***	96.5
	(.0616)	(.0671)	
Local Press	.1700***	-.1011	100
	(.0615)	(.1146)	
Trade Press	.0540	.2486***	95.1
	(.0504)	(.0936)	
Direct Mail	.0241	.4207	74.8
	(.1199)	(.5519)	
Directories	.6422***	3.000***	0
	(.1354)	(.7338)	
Constant	2.1834***		
	(.3515)		
Year Effects	Yes		
Industry Effects	No		
SD (v_i)	2.118		
N x T	494		
F Statistic	21.05***		
Within R^2	.5799		
Overall R^2	.2256		

Notes:
See Table 6.2

Table 6.7: Long Run Effects by Year

Year	LSDV		
	Advert * Year	Sales(-1)*Year	Depreciation
1984	.2683***	.1697*	99.2
	(.0950)	(.0907)	
1985	.3240***	.1222	99.9
	(.0779)	(.1025)	
1986	.2467***	.1837**	98.8
	(.0717)	(.0914)	
1987	.2386***	.2240***	96.9
	(.0699)	(.0803)	
1988	.2161***	.2846***	91.9
	(.0555)	(.0715)	
1989	.2574***	.1973***	98.3
	(.0522)	(.0735)	
1990	.2463***	.1908***	98.6
	(.0471)	(.0765)	
1991	.2401***	.2200***	98.2
	(.0453)	(.0759)	
1992	.3092***	.1304*	99.9
	(.0388)	(.0767)	
Constant	3.993***		
	(.4807)		
Year Effects	Yes		
Industry Effects	No		
SD (v_i)	1.270		
N x T	505		
F Statistic	5.79***		
Within R^2	.2891		
Overall R^2	.6689		

Notes:
See Table 6.2

Table 6.8: OLS Analysis of Fixed Effects: basic model

	(1)	(2)	(3)	(4)
Log(Advert)	.1242**	.2835***	-.0565	
	(.0504)	(.0801)	(.0500)	
[Log(Advert)]^2		.0760***	.0308**	.0389***
		(.0183)	(.1222)	(.0091)
Quality			-.1910	
			(.1313)	
Consumer			.2440	
			(.2255)	
Producer			.4898**	.3551***
			(.2214)	(.1375)
Log(Assets)			.4964***	.4706***
			(.0384)	(.0319)
Constant	.1335	-.1696	-1.873***	-1.716***
	(.1341)	(.1450)	(.2524)	(.1508)
N	109	109	109	109
F Statistic	6.08***	12.01***	38.73***	75.22***
Adj R^2	.0537	.1693	.6770	.6825
Mean Dep Variable	-.0481	-.0481	-.0481	-.0481
Heteroscedasticity	1.56	0.44	0.26	0.00
Functional Form	7.01***	1.30	0.53	0.27
Non-normality	1.74**	0.38	0.41	0.40

Notes:
1. Dependent variable is the fixed effects from Table 6.2.
2. Figures in brackets are standard errors.
3. *** indicates significance at the 1% level, ** at the 5%, * at the 10%.
4. See Chapter Four for details of the diagnostic tests.

Table 6.9: OLS Analysis of Fixed Effects: industry, media and year models

	(1) Industry Model	(2) Media Model	(3) Year Model
Log(Advert)	.3486**	.1751**	-.0337
	(.1329)	(.0771)	(.0521)
[Log(Advert)]^2	.0714**	.0175	.0333***
	(.0328)	(.0190)	(.0127)
Quality	.0441	-.0093	-.2064
	(.3730)	(.2730)	(.1367)
Consumer		.4982	.5075**
		(.3487)	(.2306)
Producer		.0812	.2398
		(.4483)	(.2348)
Log(Assets)	.3837**	.4273***	.5221***
	(.1523)	(.0653)	(.0400)
Constant	-1.160**	-1.265***	-1.928***
	(.4966)	(.4166)	(.2630)
N	81	103	109
F Statistic	-	-	40.87***
Adj R^2	.2994	.3953	.6890
Mean Dep Variable	-.1333	-.0341	-.0532
Heteroscedasticity	-	-	0.22
Functional Form	-	-	0.34
Non-normality	-	-	0.31

Notes:
1. Dependent variables in columns 1 to 3 are the fixed effects from Tables 6.3 to 6.5 respectively.
2. Standard errors in columns 1 and 2 are adjusted for heteroscedasticity.
3. For other notes see Table 6.8

Chapter 7

ADVERTISING, PRICES AND INFORMATION

7.1 INTRODUCTION

A key strand of the advertising literature emphasises that the welfare effects of advertisements depend crucially on their informational content.[54] Advertising is more likely to be welfare enhancing when it assists in the competitive process by providing useful information about both firms and products. Consequently, as Kaul and Wittink (1995) and Nagler (1993) argue, policy implications are dependent on the nature of advertisements.

This chapter focuses on what is perhaps the single most important, quantifiable piece of information - namely the price of the product. It is concerned with two questions in particular: (i) to what extent is price information included in advertising? (ii) what factors determine the extent of price advertising by firms?

It is only recently that the role of price advertising has been explicitly modelled in theoretical papers. Caminal (1996) considers a monopoly situation in which price advertising is used as a price discrimination device which leads to downwardly 'sticky' prices. Bester and Petrakis (1995), Bester (1994) and Robert and Stahl (1993) all construct models in which imperfectly informed consumers can obtain price information from advertising. In these cases, lower priced goods are advertised more intensively, thus implying an inverse relationship between prices and advertising. Lal

[54]for a useful overview see Tremblay and Tremblay (1995).

and Matutes (1994) also suggest that advertised products will be observed to have lower prices. However, in their model, the advertising of low prices is used by retailers as a method of enticing consumers into their shops. Once a consumer has selected a particular shop, a premium is charged on other, non-advertised products.

Evidence for a positive relationship between advertising and prices in the professional services market has been produced by, amongst others, Benham (1972), Kwoka (1984) and Schroeter et al (1987). In a survey article, Kaul and Wittink (1995) also conclude that the advertising of prices leads to both lower prices and increased price sensitivity.

The welfare effects of these results are somewhat ambiguous. It is possible, for example, that when consumers find it difficult to obtain information on quality, advertising prices provides an incentive for firms to cut quality and thus prices. Chan and Leland (1982) find some support for this notion that advertising may lead to lower prices but also to lower product quality. Overall, however, they find that advertising generally increases consumer welfare. Rogerson (1988) arrives at a similar result using a model in which price is able to act as a signal of quality. This is not supported by empirical evidence from the US market for optical services presented by Parker (1995). Parker finds that low-quality producers gained market share as a result of advertising deregulations. One possible reason for this is that consumers may deceive themselves in believing that they can judge firm quality when in fact they cannot.

Another possibility is considered by Guimaraes (1996) in the context of a game theoretic model of consumer search. Randomly increasing the amount of price information in his model can actually lead to higher prices unless uninformed buyers receive the extra information. Lastly, an issue not considered in the literature is that price advertising may be used by firms to increase communication within a collusive group of rivals. By advertising prices, a firm can give a signal to rivals that it has no intention of reneging on the collusive price. In addition, any firm that does renege can be punished much more effectively and quickly.

In any case, many empirical studies in the area have not given explicit consideration to price advertising. Benham (1972), for example, considered the effects of banning advertising in general. Exceptions to this include Sass and Saurman (1995) and Stephen (1994). The former investigate restrictions on price advertising, as compared to outright bans on all advertising in the brewing industry in the United States. Banning price advertising appears to increase market concentration with a particularly adverse effect on small firms. Stephen (1994) distinguishes between price and availability advertising by solicitors in Scotland. In both cases advertising is seen as informative. His conclusion is that price advertising has little effect on solicitors' fees. On the other hand, availability advertising results in demand becoming more price elastic. A key feature of Stephen's study is that the levels of advertising are modelled rather than just legal restrictions.

One of the few papers to investigate the actual content of advertising is Laband (1991). He uses logit estimation to explain the provision of information about the

quality of products in newspaper advertisements. The informative factors he considers are product guarantees, length of operation of the company and whether finance is available. Laband looks at advertisements which are, on the whole, multi-product and, as such, it is probably the work closest to the firm level approach of this study.

Laband restricts his sample to advertisements which include price information. Indeed, a consideration of the price-advertising decision by the firm seems to be non-existent in nearly all recent empirical work. As Stephen (1994) points out, studies looking at legal restrictions on advertising "do not always take account explicitly of actual advertising behaviour" (p.1178). Firms may decide not to advertise prices even when there are no legal restrictions. Very little work has been done to investigate how much price advertising takes place, and which firms are more likely to advertise prices. It is this deficiency which this study seeks to rectify.

The chief barrier to empirical work on price information in advertising is the sparsity of published data at the firm level. This chapter is able to make use of data gained from the survey described earlier in the thesis and which provides information on both the intensity of advertising and the frequency with which firms include price information.

In the next section of the chapter a simple model of the price advertising decision is developed, taking into account the search decision of the consumer. In Section 7.3, this model is tested against the survey data set using ordered probit estimation. Some concluding remarks are make in Section 7.4.

7.2 A MODEL OF PRICE ADVERTISING

The following simple model of price advertising takes an intertemporal approach based on assumptions similar to those in Sibley (1995). Each firm considers two groups of consumers - those who buy from that firm and those who do not. Only those who buy have full information about changes to that firm's prices. Other consumers only find out about changes in prices through advertising or by undertaking search. As with Sibley, advertising increases the probability that a firm contacts a potential customer at any particular time.

A firm may charge two prices, P_H or P_L (where $P_H > P_L$). Potentially the firm has a total of $m(P_j)$ customers (j = H or L). In reality, some consumers may not have full information about prices and so the actual number of customers at time t, (n_t), may be less than m. Specifically, if the firm increases its price from P_L to P_H, all its existing customers know the new price. Those not prepared to buy at P_H drop out of the market and the actual number still equals the potential number of customers. However, if the firm decreases its price from P_H to P_L, existing customers realise the price has dropped and continue to purchase. New customers who would be prepared to buy at P_L do not know that the price has changed. Here, the actual number of customers may be less than the potential number:

$$n_t \leq m(P_L) \tag{7.1}$$

In this model, information is only imperfect in the case of a decrease in price. It is in this case that the firm may have an incentive to undertake advertising which provides price information and/or for the potential consumers to undertake some search activity.

A two period game is considered here. In the first period the firm decides on its price and advertising strategy and in the second, consumers decide whether or not to buy the product.

Period 1: The price is set initially at P_H and $n_1 = m(P_H)$. In other words, all customers know that the firm is charging P_H. For some reason, such as a supply shock, the firm decides to reduce the price to P_L

Period 2: Under the new price, the firm would have $m(P_L)$ customers under perfect information. However, since some people are unaware of the price fall there are only n_2 actual customers. Let x be the difference between the potential and actual number of sales in period two:

$$x = m(P_L) - n_2 \tag{7.2}$$

When there is no advertising and no search activity, $n_2 = m(P_H)$ and x is determined purely by the price elasticity of demand of existing customers. When there is perfect information, $n_2 = m(P_L)$.

$$\text{Thus} \quad m(P_H) \leq n_2 \leq m(P_L)$$

$$\text{or} \quad 0 \leq x \leq [m(P_L) - m(P_H)] \tag{7.3}$$

Information on prices may be revealed in two ways: potential customers may undertake search activity or they may receive advertisements from firms. Search activity (S) involves a cost to the consumer and any level of advertising (a_i), which

may include information on prices, involves a cost to firm i.

In Period 1, firms decide how much price advertising to undertake following the price decrease, given the amount of search they would expect consumers to do. In Period 2, consumers decide how much search to undertake, given the amount of price advertising they receive. Thus, as in Robert and Stahl (1993), advertising and search activity are interdependent. The more a firm advertises, the less incentive there is for consumers to search, and vice versa.

The intensity of search activity will depend on its expected costs and benefits. Laband (1991) argues that the value of search for information about the quality of the good can be approximated by the price of the product. The higher is the price, the greater is the loss to the consumer if the product is a disappointment. However, there are many factors other than price which affect the benefits of search. Stigler (1961), for example, suggests that consumer search will be less worthwhile for final, than for intermediate, consumers. A firm buying an expensive piece of machinery is much more likely to search around for the best deal than someone thinking about buying a chocolate bar. However, in addition, the firm buying machinery may have a host of other specifications (such as highly specialised technical requirements) which render price less important than even similarly priced consumer goods. When features such as quality or technical specifications are very important, the benefits from search on price may be very low even for quite expensive goods. Thus, in this model, the value of search in a market is modelled quite generally as depending on the relative importance of price in that market.

Laband (1991) ignored the cost of search due to lack of data. Here it is assumed that the cost of search for consumers is constant across firms and dependent solely on the number of competing firms in the market. The more firms there are to search amongst, the more expensive it is for consumers to obtain full information on prices from search.

From the firm's point of view, their decision on how much price information to give will depend on how many extra consumers are expected to result from the advertising (at its maximum equal to x) and also on its expected cost. The former will be a positive function of the importance of price to consumers in that market and a negative function of the amount of search that consumers decide to undertake. This model focuses on the intensity of price information in a firm's advertisements rather than the amount of advertising itself. It is therefore assumed (following Laband, 1991) that, for any given level of advertisements, a_i, the marginal cost to firm i of providing price information is constant[55]. For simplicity, it is further assumed that all firms in a particular market adopt the same price advertising strategy. This gives us:

$$p_i = p_i(S,\tau) \tag{7.4}$$

$$S = S(p_i,\tau,N) \tag{7.5}$$

where p_i = proportion of firm i's advertisements that contain price information.

[55]To be precise, Laband actually assumes that the cost of including information is zero for any level of advertising. However, presumably there is some opportunity cost in including price information rather than some other advertising content.

S = amount of search consumers undertake in firm i's market

τ = relative importance of price in firm i's market.

N = number of companies in firm i's market.

The above discussion implies the following partial derivatives: $\partial p_i/\partial S < 0$; $\partial p_i/\partial \tau > 0$; $\partial S/\partial p_i < 0$; $\partial S/\partial \tau < 0$; $\partial S/\partial N < 0$. In addition, it is assumed that $\partial p_i/\partial S > -1$ and $\partial S/\partial p_i > -1$. That is, an increase in search will not cause the total amount of price advertising to decline more than proportionately and vice versa.

Combining (7.4) and (7.5) gives us a reduced form equation for price advertising:

$$p_i = p[S(p_i, \tau, N), \tau] \tag{7.6}$$

Of interest here is what happens to price advertising as the number of firms and the importance of price change.

As the number of firms increase, so does the cost of comprehensive search and, all else being equal, firms expect lower levels of search. This gives firms an incentive to increase the amount of price information they provide. More formally, the total derivative of p_i with respect to N is given by:

$$\frac{dp_i}{dN} = \frac{\frac{\partial p_i}{\partial S} \cdot \frac{\delta S}{\partial N}}{1 - \frac{\partial S}{\partial p_i} \cdot \frac{\partial p_i}{\partial S}} \tag{7.7}$$

From the partial derivatives above, it is clear that both the numerator and the denominator of equation (7.7) are positive, implying the total derivative is also positive. This contrasts with Robert and Stahl (1993) who find that entry reduces the

total amount of advertising (although firms compete more aggressively on price).

As the importance of price in the market increases, there are two effects. First, the number of potential new customers following a price cut is increased, suggesting that firms will engage in more price advertising. At the same time, firms expect consumers to search more, implying an indirect negative effect on price advertising. Again, the overall effect can be formally shown through the total derivative of p with respect to τ:

$$\frac{dp_i}{d\tau} = \frac{\frac{\partial p_i}{\partial S}\cdot\frac{\partial S}{\partial \tau} + \frac{\partial p_i}{\partial \tau}}{1 - \frac{\partial S}{\partial p_i}\cdot\frac{\partial p_i}{\partial S}} \tag{7.8}$$

The total derivative is positive only if:

$$-\frac{\partial p_i}{\partial S}\cdot\frac{\partial S}{\partial \tau} < \frac{\partial p_i}{\partial \tau} \tag{7.9}$$

As it has been assumed that $\partial p_i/\partial S > -1$, the total derivative will be positive if $\partial p_i/\partial \tau$ is not less than $\partial S/\partial \tau$. In other words, an increase in price importance will increase price advertising if the direct effect on price advertising is greater or equal to the direct effect on search. In situations where search is very important (for example in the case of some producer goods), the effect of price importance may disappear or even become negative.

7.3 TESTING THE MODEL

7.3.1 The Data

Firms were asked to quantify the percentage of their advertisements which included

price information as follows: "About what percentage of your adverts provide specific information about the price of your products? 0%, 0-10%, 10-50%, 50-75% 75-100%".

This provides us with a simple, discrete measure of the intensity of price information in advertisements at firm level. As discussed previously, the reliability of this information is open to question. One particular issue is the definition of price advertising. Does it, for example, include money off coupons. Once again, the point is that the definition is left to managers filling in the questionnaire and it is in their perception of what they are doing that we are interested. Further, given that information about UK advertising at the level of the firm is sparse and published data on price information in advertisements is non-existent, the dataset used in this chapter is quite unique. This alone suggests that the data considered here merits serious attention.

Table 7.1 summarises the 233 firms who are advertisers and who provided an answer to the price information question. Notably the majority (77%) of firms provide either very little price information or none at all. In 17% of cases, more than half of all advertisements include information on prices.

The mean level of price advertising (estimated at the class mid-points) is within the 10 - 50% category. Consequently, the five ordered levels of price advertising are henceforward referred to (with some abuse of terminology) as "none", "few", "average", "many" and "nearly all".

Table 7.2 breaks down the sample into manufacturing, service and distribution companies. Predictably price information seems to be much more intensive for distributors. Interestingly, in the light of the amount of work that has focused on price advertising in the professions, only a small minority of advertisements by service companies include information about prices.

Table 7.3 classifies companies according to whether they produce primarily intermediate (producer) goods, consumer non-durables or durables. A higher percentage of advertisements in both consumer sectors contain price information than in the producer goods sector, whilst advertisements by consumer durables firms contain price information more often than those by non-durables firms.

The survey also provides data on the determinants of price information. The importance of price to consumers is modelled by two separate variables.

Firstly, the survey asked firms to rank different forms of competition, such as price and quality, in order of importance in their markets. A dummy variable is constructed for firms who rank price as being one of the three most important forms of competition.

Secondly, we follow Stigler (1961) in considering the relative value of search in consumer and producer markets. Buxton et al (1984) demonstrate that, as very few firms sell exclusively to either final or intermediate consumers, simple sample restriction leads to biased estimates. Here, survey data on advertising media is used

to estimate the percentage of each firm's advertisements which are aimed at final consumers.

Laband (1991) finds durable goods significant in explaining informational advertisements (although, given that one of the main pieces of information considered is the provision of finance, this may be a trivial result). Thus, a dummy variable for consumer durable goods is included as a potential determinant of price advertising. Clearly some or all of the effect of both this variable and that for consumer goods may be taken up in the importance of price variable.

Evidence on the number of firms in the market is also gained from the survey and a dummy variable indicating those firms who say they face more than ten competitors is constructed. Inclusion of the additional variables and the exclusion of some companies for whom price information is mandatory (namely those involved with drug promotion to GP's) reduces the sample to 216. Of these, 149 include price information in "none" of their advertisements, 16 in "few", 15 in "average", 9 in "many" and 27 in "nearly all".

7.3.2 Econometric Specification

Due to the ordinal nature of responses to the question on price information, it is appropriate to obtain ordered probit estimates. Let z_i^* denote the (unobserved) intensity of price advertising by firm i. The variable z_i^* is related to the ordinal variable z_i as follows:

$$z_i = \begin{cases} 1 \;\; if \;\; z_i^* < \delta_1 \\ 2 \;\; if \;\; \delta_1 < z_i^* < \delta_2 \\ 3 \;\; if \;\; \delta_2 < z_i^* < \delta_3 \\ 4 \;\; if \;\; \delta_3 < z_i^* < \delta_4 \\ 5 \;\; if \;\; \delta_4 < z_i^* \end{cases}$$

where δ_i's are the thresholds defining the boundaries of different levels of price advertising intensity[56].

As discussed above, price advertising intensity is a function of various explanatory variables contained in the vector, x_i, as follows:

$$z_i^* = x_i'\gamma + \epsilon_i \quad \epsilon_i \sim N(0, \sigma^2)$$

The probability that a firm includes no price advertising in its advertisements is:

$$\begin{aligned} Pr[z_i = 1] &= Pr[z_i^* < \delta_1] \\ &= Pr[x_i'\gamma + \epsilon_i < \delta_1] \\ &= Pr\left[\frac{\epsilon_i}{\sigma} < \frac{\delta_1}{\sigma} - \frac{x_i'\gamma}{\sigma}\right] \qquad where \;\; \frac{\epsilon_i}{\sigma} \sim N(0, 1) \\ &= F\left[\frac{\delta - x_i'\gamma}{\sigma}\right] \\ &= F[\theta_1 - x_i'\beta] \qquad where \;\; \theta_1 = \frac{\delta_1}{\sigma};\; \beta = \frac{\gamma}{\sigma} \end{aligned}$$

where F is the standard normal distribution function. The probabilities for the other categories are:

---

[56]Details of the ordered probit model can be found in Greene (1993).

$$
\begin{aligned}
Pr[z_i = 2] &= F[\theta_2 - x_i'\beta] - F[\theta_1 - x_i'\beta] \\
Pr[z_i = 3] &= F[\theta_3 - x_i'\beta] - F[\theta_2 - x_i'\beta] \\
Pr[z_i = 4] &= F[\theta_4 - x_i'\beta] - F[\theta_3 - x_i'\beta] \\
Pr[z_i = 5] &= 1 - F[\theta_4 - x_i'\beta]
\end{aligned}
$$

where $z_i = 2$ represents firms who say they include price information in "few" advertisements and so on.

Maximum likelihood estimates of both the coefficients and the thresholds are obtained. The dependent variable is the percentage of advertisements containing information on prices.

In addition to the variables which proxy for the importance of price and the dummy for more than ten competitors (discussed above), a dummy variable for firms in the distribution sector is included in the vector of exogenous variables. For obvious reasons, this is expected to attract a positive coefficient. To validate the assumption of a constant marginal cost of price advertising, the level of advertising intensity is included (following Laband, 1991). All else being equal, lower advertising costs will be associated with higher levels of advertising. Thus a positive coefficient is expected on this variable.

Lastly, a dynamic element is introduced into the analysis by including a dummy variable indicating whether firms state that they would increase advertising in response to a recession. This to some extent surmounts problems associated with the cross-sectional nature of the data. The survey took place in 1992, when the UK was experiencing a deep recession which may have affected both firms and consumers. In

particular, prices may have been much more important in some industries at such a time. If so, it can be expected that firms who increase their advertising during a recession are likely to include more price information.

7.3.3 Estimates of the Determinants of Price Advertising

Table 7.4 presents estimates of price information in advertising based on the five levels. column 1 gives estimates of the model including the consumer durable dummy. As this variable never proves to be significant in this or any subsequent specification, it is omitted from the following reported regressions. All five of the remaining variables are positive and significant, Advertising Intensity at the 10% level and the others at 5% or better.

The theoretical model predicted that price advertising will be more prevalent the greater the number of rivals there are competing in the market. This is clearly backed up in column 2 with the significantly positive coefficient on the "more than 10 rivals" variable. The positive coefficient on the importance of price dummy variable indicates that price advertising is more likely where price is considered to be very important. In terms of the model, as the importance of price increases, the direct effect of firms increasing their price advertising outweighs any reduction from an increase in expected consumer search.

As expected, price advertising is more prevalent both for firms involved in distribution and for firms whose advertisements are more consumer orientated. Finally, firms that increase advertisements during a recession do seem to include price

information more often, suggesting that this is a useful control to include[57].

The diagnostic test statistics for functional form, heteroscedasticity and non-normality are all insignificant at conventional levels. The one problem is threshold heterogeneity. The null hypothesis of homoscedastic thresholds is rejected at the 5% level of significance. Inspection of the individual variables suggests that the dummy for price importance is the offending variable. In other words the coefficient for this variable seems to vary across the different categories. Consequently, the sample is split into two groups - one containing firms who say that price is an important form of competition and another made up of those who do not. Estimates for these two groups are reported in columns 3a and 3b respectively of Table 7.4.

Several differences between the two models stand out. Where price is not important, neither the consumer nor the advertising intensity variables are significant. Furthermore, there is a considerable variation in all the coefficients across the two models. The threshold heterogeneity problem is somewhat reduced, but the null of homogeneous thresholds must still be rejected at the 5% level in both cases. In addition, the null hypotheses of non-normality in 3a and of normality in 3b is rejected at the 5% level.

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[57]The reported diagnostic test results can be interpreted as follows. The functional form statistic tests for the addition of powers to the second, third and fourth degree and is distributed as $\chi^2(3)$. The heteroscedasticity statistic, testing the null hypothesis that the error term variance, σ^2, = 1, is distributed as $\chi^2(k)$, where k is the number of variables. The threshold heterogeneity statistic tests the null hypothesis of homogenous thresholds and is distributed as $\chi^2[k(J - 2)]$ where J is number of intervals into which z^*_i falls. Lastly, the non-normality statistic is a $\chi^2(2)$ test for skewness in the error term. For more details on the construction of the test scores see Machin and Stewart (1990).

The model for the whole sample was reestimated including interaction terms with the price importance variable suggested by the varying coefficients. The interaction term between the consumer and advertising intensity variables proves to be significant and these estimates are presented in column 4. Variables not significant at the 10% level are omitted in turn leaving the model reported in column 5.

These results indicate that the importance of price as a form of competition has an effect on price advertising only in consumer markets and where advertising intensity is high. This makes sense intuitively. Where price is very important in producer markets, we would expect search by the buyers to be the appropriate response. In terms of the model, the direct effect of an increase in price importance on price advertising is drowned out by the indirect effect of buyers increasing their search activity. Unfortunately, threshold heterogeneity still proves to be a problem, this time with other variables seemingly responsible. The most likely reason is the fact that only nine firms in the sample are categorised as including price information in "many" of their advertisements. Thus the approach now taken is to collapse both the "many" and the "average" firms into one category, "many or average".[58]

Estimates of this four category ordered response model are presented in Table 7.5. In column 1 the basic model is re-estimated. All six variables are positive and significant at the 5% level or better. The null hypothesis of homogeneous thresholds can now not be rejected at the 5% level. Once again the other diagnostic statistics

[58]When the 50-75% and 75-100% classes were collapsed, neither the order nor magnitude of the estimates were greatly changed. However, this procedure did not eliminate the problem of heterogeneous thresholds.

indicate no problems with functional form, heteroscedasticity or non-normality.

In addition to those included previously, the following interaction terms are considered in column 2: Advertising Intensity and Distributor; Advertising Intensity and % Consumers; % Consumers and distributors. Variables not significant at the 10% level are omitted leaving the more parsimonious model presented in column 3.

Once again, it seems that the price importance effect is restricted to consumer orientated firms. Both the other consumer interaction terms are strongly significant: that with Advertising Intensity is negative whilst that with Distributor is positive. Consumer firms seem to be less likely to include price information very often when they are intensive advertisers. The distributor effect is enhanced when the firm is more orientated to final consumers.

Industry Effects

A possible pitfall with cross-sectional samples is that the estimated effects may be dependent on industry-specific factors. To control for this possibility, a series of industry dummies are introduced into the model. The sample size dictates that 2-digit (as opposed to 3-digit) industries are used. Consequently, the model is estimated with 48 SIC 2-digit dummy variables each in turn. Only two industry dummies are significant at the 10% level - those for SIC industries 16 and 50. Column 4 presents the estimates for the basic model including these two variables. Reassuringly, all the other variables remain significantly positive with the exception of the control dummy for firms who increase advertising during a recession. This still attracts a positive

coefficient, but is no longer significant even at the 10% level.

The interaction terms are included as before in column 5. Unfortunately the null threshold heterogeneity test statistic is now significant at the 5% level, the offending variable being the dummy for SIC Industry 50. The model is re-estimated in column 6, omitting the 11 firms from Industry 50. The null hypothesis of homogeneous thresholds can now not be rejected at the 5% level. Once again variables which are insignificant at the 10% level are omitted in turn leaving the final regression in column 7. The only major difference with the results without the industry dummies is that the interaction term between advertising intensity and price importance is no longer even weakly significant.

7.3.4 Probability Effects on Price Advertising

The coefficients in Table 7.3 indicate the direction of any link between variables, but say nothing about the magnitude of that link. Tables 6 and 7 translate the probit estimators into the probability effects of a firm having certain proportions of advertisements which contain price information. Table 7.6 shows the direct probability effects of five variables as implied by Table 7.5, column 4. Firms with more than ten competitors are estimated to have a 13.8% lower probability of having no advertisements with price information and a 7.4% higher probability of having price information in nearly all their advertisements. Where price is considered important, firms are 16.9% less likely to have price information in none of their advertisements, while distributors are 26.8% less likely.

Also calculated in Table 7.6 are the probability effects of an increase in advertising intensity. An increase of 1 percentage point (calculated from the mean) is associated with a 2.5% lower probability that no advertisements carry price information. Similarly, firms which aim their advertisements solely at consumers are estimated to be nearly 20% more likely to have no advertisements with price information than producer firms.

Table 7.7 explores the magnitude of the probability effects from interaction between the variables as implied by Table 7.5, column 7. Of particular interest is the interaction between the importance of price and the consumer variables. Pure consumer firms, for whom price is important, are a massive 42% less likely to have no advertisements which include price information compared to those for whom price is not considered important. As explained above, the importance of price seems to have no effect on the intensity of price advertising for producer firms. This fits in nicely with the theoretical discussion which suggested precisely this result.

Given the problems experienced with heterogenous thresholds, it is useful to check the stability of the probability effects across all the estimated regressions. For ease of presentation this is done only for the "more than ten competitors" variable as this is significantly positive in every regression. The probability effects are presented in Table 7.8. The probabilities vary very little, with the exception of the cases from columns 3a and 3b in Table 7.4 where the sample was split into two. In both these cases, however, the diagnostic tests cast some doubt over the results. In the other regressions, the lower probability of having no price information for firms with more

than ten competitors varies only between 13.7% and 14.8%. The increased probability of having price information in nearly all advertisements varies from 6.6% to 7.6%, the probability being slightly lower when the firms from SIC Industry 50 are left out.

7.4 CONCLUSIONS

This chapter has investigated the extent to which firms' advertisements contain information which might be seen as welfare enhancing. It has concentrated on the price advertising decision, an area which existing literature has left virtually untouched.

A simple model of the factors that influence the amount of price information provided by a firm has been developed. A key feature of this model is the way in which advertising decisions by firms and search decisions by consumers are viewed as being interdependent.

This model was tested against the survey. Only a minority of firms include price information in any advertisements at all. Notably, despite the amount of work which has focused on price information in the professional services market, this is true even in the service sector. Results suggest that price information tends to be included in a larger percentage of the advertisements of distribution companies and of those which aim more of their advertisements towards consumers. Other factors that emerge as important are the number of firms competing in the market and the general intensity of advertising by the firm.

The importance of price as a form of competition seems to increase price advertising only when aimed at consumers. When the price of producer goods is important, the response seems to be one of increased search rather than more intensive price advertising. These results are robust to numerous diagnostic tests, two specifications of the dependent variable and also to the inclusion of two-digit industry dummy variables.

Up until now, empirical work on the price advertising decision of firms has been virtually non-existent. Although the reliability of data gained from surveys in general is open to question, it is difficult to envisage other ways in which relevant data might be obtained. Apart from the insights provided into who advertises prices, this chapter provides a useful example of the way in which surveys may help to overcome the difficulty of obtaining data on the information-providing process.

Table 7.1: The Extent of Price Advertising

Percentage of Adverts Containing Price Information	Number of Firms	Percentage of Firms
0	160	69
0 - 10	18	8
10 - 50	16	7
50 - 75	9	4
75 - 100	30	13
Total	233	100

Table 7.2: Price Advertising by Type of Firm

Type of Company	Mean Amount of Price Advertising (%) (using class mid-points)	Number in Sample
Manufacturing	11.4	145
Service	16.7	51
Distribution	37.2	37
All firms	16.6	233

Table 7.3: Price Advertising by Type of Product

Type of Company	Mean Amount of Price Advertising (%) (using class mid-points)	Number in Sample
Producer	11.2	104
Consumer Durable	24.8	27
Consumer Non-durable	18.9	74
All firms	16.6	233

Table 7.4: Ordered Probit Estimates of Price Information in Advertising (5 categories)

	(1)	(2)	(3a)	(3b)	(4)	(5)
More than 10 Competitors	.479**	.474**	.378*	1.230*	.490**	.490**
	(.202)	(.201)	(.226)	(.630)	(.204)	(.203)
Price Important	.696***	.704***			.0485	
	(.220)	(.220)			(.325)	
Distributor	.750***	.763***	.659**	1.474***	.739***	.732**
	(.231)	(.230)	(.270)	(.541)	(.233)	(.232)
A/S	.0679*	.0672*	.0845*	-.0478	.00388	
	(.0356)	(.0356)	(.0435)	(.0715)	(.0632)	
Increases in a Recession	.533**	.513**	.344	1.233**	.508**	.507**
	(.246)	(.244)	(.286)	(.539)	(.248)	(.242)
% Consumers	5.46 e-3***	5.68 e-3***	8.38 e-3***	1.82 e-4	-1.38 e-3	
	(2.13 e-3)	(2.09 e-3)	(2.51 e-3)	(4.33 e-3)	(3.96 e-3)	
Consumer Durables	.144					
	(.270)					
A/S*Price Important					.0859	.0931**
					(.0769)	(.0423)
% Consumer*Price Important					9.49 e-3**	8.46 e-3***
					(4.70 e-3)	(2.36 e-3)

.../cont

Table 7.4 (cont)

	(1)	(2)	(3a)	(3b)	(4)	(5)
θ_1	1.908	1.899	1.227	2.223	1.384	1.374
	(.286)	(.285)	(.220)	(.698)	(.328)	(.193)
θ_2	2.174	2.164	1.486	2.577	1.657	1.646
	(.292)	(.291)	(.226)	(.714)	(.332)	(.199)
θ_3	2.483	2.473	1.767	3.070	1.971	1.960
	(.302)	(.301)	(.236)	(.750)	(.340)	(.210)
θ_4	2.714	2.703	2.048		2.205	2.195
	(.311)	(.310)	(.249)		(.347)	(.220)
Log L	-197.27	-197.41	-154.08	-35.28	-194.09	-194.22
Pseudo R2	0.1103	0.1097	0.1100	0.1876	0.1247	0.1240
N	216	216	155	61	216	216
Diagnostic Tests:						
Functional form	4.79	5.52	4.15	10.72	4.25	4.12
	(7.81)	(7.81)	(7.81)	(7.81)	(7.81)	(7.81)
Heteroscedasticity	3.83	3.70	3.14	2.53	6.53	3.88
	(14.07)	(12.59)	(11.07)	(11.07)	(15.51)	(11.07)
Threshold heterogeneity	59.72	57.09	46.03	37.96	76.46	40.75
	(32.67)	(28.87)	(25.00)	(18.31)	(36.42)	(25.00)
Non-normality	4.05	4.12	6.85	2.21	8.39	7.37
	(5.99)	(5.99)	(5.99)	(5.99)	(5.99)	(5.99)

Notes:
1. Figures in brackets below estimates are asymptotic standard errors.
2. * indicates significance at the 10% level, ** at the 5% and *** at the 1%.
3. Figures in brackets below the diagnostic tests are 5% critical values.

Table 7.5: Ordered Probit Estimates of Price Information in Advertising (4 categories)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
More than 10 Competitors	.489**	.552***	.553***	.497**	.570**	.593***	.561***
	(.202)	(.209)	(.209)	(.214)	(.223)	(.223)	(.213)
Price Important	.687***	.0951		.633***			
	(.219)	(.336)		(.223)			
Distributor	.737***	.652*	.645*	.837***	.825**	.808**	.794**
	(.230)	(.383)	(.381)	(.233)	(.386)	(.385)	(.383)
A/S	.0713**	.156*	.148**	.0827**	.180**	.169**	.233***
	(.0357)	(.0811)	(.0734)	(.0360)	(.0744)	(.0737)	(.0627)
Increase in a Recession	.490**	.521**	.514**	.343	.347	.249	
	(.244)	(.252)	(.251)	(.252)	(.261)	(.276)	
% Consumers	5.40e-3***	1.82 e-3		6.60e-3***			
	(2.10 e-3)	(4.89 e-3)		(2.15 e-3)			
A/S*Price Important		.117	.117*		.0971	.102	
		(.0837)	(.068)		(.0680)	(.0678)	
% Consumer*Price		7.63 e-3	9.23e-3***		.0106***	.0101***	.0118**
Important		(4.92 e-3)	(2.75 e-3)		(2.82 e-3)	(2.83e-3)	(2.57e-3)
		-2.23e-3**	-2.08e-3***		-2.03e-3**	-1.91e-3**	-.00186**
Consumer*A/S		(9.24 e-3)	(7.95 e-4)		(7.95 e-4)	(7.89e-4)	(7.75e-4)
		-.193**	-.199**		-.219**	-.216**	-.212**
Distributor*A/S		(.0916)	(.0903)		(.0903)	(.0899)	(.0883)
		.0104*	.0108**		.0104*	.0110**	.0109**
Distributor*% Consumer		(5.44 e-3)	(5.25 e-3)		(5.27 e-3)	(5.26 e-3)	(5.25e-3)

.../cont

Table 7.5 (cont.)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Industry 16				1.522**	1.721**	1.793**	1.873**
				(.755)	(.760)	(.764)	(.752)
Industry 50				1.108***	1.186***		
				(.388)	(.392)		
θ_1	1.887	1.615	1.519	2.005	1.696	1.666	1.658
	(.285)	(.352)	(.210)	(.296)	(.226)	(.225)	(.223)
θ_2	2.153	1.904	1.808	2.284	2.003	1.975	1.964
	(.291)	(.357)	(.218)	(.303)	(.235)	(.234)	(.232)
θ_3	2.678	2.486	2.388	2.841	2.627	2.672	2.653
	(.309)	(.374)	(.242)	(.323)	(.262)	(.268)	(.265)
Log Likelihood	-182.25	-172.23	-172.31	-176.42	-165.47	-153.79	-155.17
Pseudo R2	0.1147	0.1633	0.1629	0.1430	0.1962	0.1934	0.1861
N	216	216	216	216	216	205	205
Diagnostic Tests:							
Functional form	5.22	0.43	0.37	7.93	1.33	0.14	0.60
	(7.81)	(7.81)	(7.81)	(7.81)	(7.81)	(7.81)	(7.81)
Heteroscedasticity	3.99	9.48	7.87	8.93	13.58	10.93	6.06
	(12.59)	(19.68)	(16.92)	(15.51)	(19.68)	(16.92)	(14.07)
Threshold heterogeneity	8.52	39.37	26.24	20.85	37.28	27.10	25.38
	(19.68)	(33.92)	(28.87)	(26.30)	(33.92)	(31.41)	(26.30)
Non-normality	3.46	1.90	2.13	3.49	2.43	3.61	2.52
	(5.99)	(5.99)	(5.99)	(5.99)	(5.99)	(5.99)	(5.99)

Notes
As for Table 7.4.

Table 7.6: Probability Effects (basic model)

Difference in probability for firms with more than 10 competitors:	
Pr(No ads with price info)	-0.138
Pr(Few ads)	0.021
Pr(Average/many)	0.044
Pr(Nearly all ads)	0.074
Difference in probability for firms for whom price is important:	
Pr(No ads with price info)	-0.169
Pr(Few ads)	0.025
Pr(Average/many)	0.054
Pr(Nearly all ads)	0.090
Difference in probability for distributors:	
Pr(No ads with price info)	-0.268
Pr(Few ads)	0.022
Pr(Average/many)	0.069
Pr(Nearly all ads)	0.177
Change in probability for increase in advertising intensity of 1 unit from the mean:	
Pr(No ads with price info)	-.0246
Pr(Few ads)	0.022
Pr(Average/many)	0.069
Pr(Nearly all ads)	0.177
Difference in probability for pure consumer compared to pure producer firms:	
Pr(No ads with price info)	-0.195
Pr(Few ads)	0.006
Pr(Average/many)	0.010
Pr(Nearly all ads)	0.008

1. Notes:

1. The marginal effects for dummy variables are calculated as [pr(z = i | dummy variable = 1)] - [pr(z = i | dummy variable = 0)].
2. The marginal effects for continuous variables are calculated as [pr(z = i | continuous variable = mean) - [pr(z = i | continuous variable = mean + 1)], i= 1..5, evaluated at the mean of the dependent variables.

Table 7.7: Probability Effects (interaction terms)

Difference in probability: increased advertising intensity of 1 unit from the mean x distributors	
Pr(No ads with price info)	0.049
Pr(Few ads)	-0.015
Pr(Average/many)	-0.023
Pr(Nearly all ads)	-0.011
Difference in probability: pure consumer firms x distributors.	
Pr(No ads with price info)	-0.408
Pr(Few ads)	0.037
Pr(Average/many)	0.149
Pr(Nearly all ads)	0.223
Difference in probability: pure consumer firms x advertising intensity.	
Pr(No ads with price info)	0.116
Pr(Few ads)	-0.024
Pr(Average/many)	-0.052
Pr(Nearly all ads)	-0.040
Difference in probability: pure consumer firms x price important.	
Pr(No ads with price info)	-0.423
Pr(Few ads)	0.010
Pr(Average/many)	0.212
Pr(nearly all ads)	0.201

Notes:
See Table 7.6.

Table 7.8: Probability Effect of More than Ten Competitors Across All Regressions

	Pr(None)	Pr(Few)	Pr(Average)	Pr(Many)	Pr(Ave or Many)	Pr(Nearly All)
TAB 7.4:						
Column 1	-0.138	0.021	0.026	0.019	0.045	0.073
Column 2	-0.137	0.020	0.026	0.019	0.044	0.073
Column 3a	-0.115	0.013	0.017	0.018	0.035	0.066
Column 3b	-0.210	0.062	0.067	-	-	0.081
Column 4	-0.137	0.021	0.026	0.018	0.044	0.072
Column 5	-0.138	0.022	0.026	0.018	0.044	0.072
TAB 7.5:						
Column 1	-0.142	0.021	-	-	0.045	0.076
Column 2	-0.148	0.024	-	-	0.048	0.076
Column 3	-0.148	0.024	-	-	0.048	0.076
Column 4	-0.138	0.021	-	-	0.044	0.074
Column 5	-0.144	0.023	-	-	0.047	0.074
Column 6	-0.148	0.026	-	-	0.054	0.068
Column 7	-0.143	0.025	-	-	0.052	0.066

Chapter 8

ADVERTISING STRATEGIES: Rivals and Cyclical Behaviour

8.1 INTRODUCTION

A great deal of work on the microeconomic behaviour of firms focuses on price or quantity as the appropriate choice variables available to the firm. Some work (predominantly theoretical) emphasises the strategic nature of these variables (see for example Friedman, 1988). There are, however, other strategic variables available to companies, a point that has very much been drawn out by the explosion of game theoretic models which have been developed over the last ten to fifteen years. Some examples of additional strategic variables are capacity, advertising and production quality.

Until relatively recently, little empirical work focused on the way in which strategic interaction occurs over these sorts of variables. An exception was Cowling et al. (1975) who provided some evidence that firms take note of rivals' expected reactions when making advertising expenditure decisions. The past few years have seen more work being undertaken in this area. Smiley (1988), for example, reports survey evidence which tries to evaluate between different forms of competition. Advertising has received particular attention from other authors of recent empirical studies. Gasmi et al. (1990) analyze collusive strategies on price and advertising in the soft drinks industry and conclude that firms' price decisions are basically collusive whilst advertising decisions tend to be competitive. In a similar vein, Slade (1995) uses a game theoretic approach to distinguish between predatory and cooperative advertising

and looks also at the "strategic substitutability" of price and advertising decisions in the grocery industry. Lastly, Roberts and Samuelson (1988) use a dynamic model to investigate the interdependence of advertising decisions in the tobacco industry, concluding that firms do behave as if present decisions on advertising will change the future decisions of rival firms. To date, the only empirical work that investigates these kinds of issues using UK data is Cubbin and Domberger (1988). They employ MEAL data to identify firms who use advertising to respond to entry in consumer markets and find that, where other barriers already exist, advertising is used as a credible deterrent.

In this chapter the extent and nature of advertising competition is examined, drawing on the survey evidence discussed earlier in the thesis. Two aspects of strategic interaction through advertising are considered. The first is the extent to which firms respond to perceived changes in advertising by their competitors. The second concerns the cyclical responsiveness of advertising. The basic approach is to analyze managers' responses to questions on how they would change their behaviour either in response to rivals or to shifts in the business cycle. The possibility of asymmetric responses are also considered where, for example, managers state that they would respond to rivals' advertising increases by also increasing their own advertising but elicit no response to downward changes by rivals (and vice-versa). The empirical work involves the estimation of a set of econometric models of the determinants of advertising strategies. The models are tested for the existence of asymmetric strategic response in reactions to rivals or cyclical shifts, and managers' expectations concerning advertising behaviour are related to a variety of firm- and industry-level

factors.

The structure of the rest of the chapter is as follows. In Section 8.2 economic approaches to modelling corporate advertising behaviour are briefly examined. Some descriptive statistics on the raw data are presented in Section 8.3. In Section 8.4 some econometric models are presented which attempt to explain under what circumstances managers are likely to change their advertising strategies in response to their rivals. In Section 8.5, similar models analysing the cyclical aspects of firm advertising are reported. Finally, Section 8.6 offers some concluding remarks.

8.2 ADVERTISING AND CORPORATE BEHAVIOUR

8.2.1 Advertising as a Strategic Variable

Advertising has often been considered in oligopoly models, under a variety of assumptions about rivals' reactions. To illustrate this, consider firm i's demand function as:

$$q_i = q_i(p, A_i, A_R) \tag{8.1}$$

so that the output produced by firm i (q_i) depends on the market price (p), the advertising undertaken by firm i (A_i) and advertising of rivals (A_R).[59]

The profit function of firm i is:

[59]By assuming p is the market price charged by all firms in the market, the price rivalry term is effectively being suppressed on the grounds of simplicity. A more realistic model would also allow for the possibility of rivalrous pricing behaviour.

$$\Pi_i = pq_i - c(q_i) - A_i \qquad (8.2)$$

where c(.) denotes costs.

Under profit maximisation a firm will choose a level of advertising that satisfies:

$$\frac{\partial \Pi_i}{\partial A_i} = (p - \frac{\partial c_i}{\partial q_i}) [\frac{\partial q_i}{\partial A_i} + \frac{\partial q_i}{\partial A_R} \frac{dA_R}{dA_i}] - 1 = 0 \qquad (8.3)$$

Rivalrous behaviour emerges from the presence of the last term in the square bracket which (for a non-zero value of da_R/dA_i) reflects a strategic dependence of firms' advertising behaviour. It is clear that Cournot-Nash strategies suggest that dA_R/dA_i be zero. On the other hand, other strategies may suggest a degree of interdependence in advertising.

Clearly, one may view advertising as a strategic instrument in the same way as other variables (most commonly price) and define strategic response functions in an analogous manner. Following Bulow et al.'s (1985) distinction one may think of advertising as being a strategic complement (upward sloping reaction functions) for firms i and j if $dA_i/dA_j > 0$ and as being a strategic substitute if $dA_i/dA_j < 0$. This is a useful distinction and one on which the empirical analysis below can shed some light.

In comparing strategic instruments available to firms, many industrial economics textbooks have stressed that advertising is a very different variable to price in its ability to generate strategic actions on the part of players in a given market (a good discussion is in Scherer and Ross, 1990 pp.594-7). It is often argued that rivalrous advertising strategies may be more difficult to implement (compared to price changes).

This is due to the time lags that may be involved in setting up rival advertising campaigns and also, because designing a suitable advertising response to an increase/decrease by rivals involves many more dimensions than simply equalising or adjusting prices. It has also been argued that rivalrous advertising behaviour is less likely to be observed in markets with more stability, whether via stable demand or a persistent concentrated market structure (Fellner, 1949). This suggests some degree of heterogeneity in the likelihood of responses to changes in advertising amongst competitors, and this is investigated in some detail in the empirical work below.

A second important aspect of potentially rivalrous behaviour concerns whether firms respond in a symmetric or asymmetric manner to changes in rivals' advertising. In terms of the definitions of strategic complementarity/substitutability defined above this is rarely discussed, yet much of the discussion on rivalrous advertising behaviour tends to highlight reactions to increases in rivals' advertising. For example, much of the talk about high advertising in the cigarette industry has argued that this comes about via rivalrous reactions to increases in advertising. Less focus has been placed on what companies do if their rivals reduce advertising. Else (1966), for example, discusses the situation where a firm operating in an oligopolistic market would expect rivals to follow an increase in advertising but not react to a decrease.[60] The empirical work below considers whether there is any evidence of such asymmetries in the advertising behaviour of UK companies.

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[60]It is clear that such firms have little incentive to advertise if they feel that their rivals will match them. However, given the perceived possibility of 'winning' on advertising mentioned above, a ratchet effect, which increases advertising for all companies may well come into play over time.

8.2.2 The Cyclical Behaviour of Advertising Strategies

A sizable strand of the empirical literature on advertising has considered its evolution over the business cycle. The usual prediction is that advertising is likely to display a procyclical tendency, rising in booms and falling in recessions. Consider the following rearrangement of equation (8.3):

$$\frac{A_i}{pq_i} = PCM_i.[\epsilon_{qA} + \epsilon_{qR}.\epsilon_{RA}] \qquad (8.4)$$

where A_i/Pq_i is the advertising-sales ratio, PCM_i [$= (p - \partial c_i/\partial q_i) / p$] is the price-cost margin, ϵ_{qA} [$= (\partial q_i/\partial A_i).(A_i/q_i)$] is the elasticity of own output with respect to advertising, ϵ_{qR} [$= (\partial q_i/\partial A_R).(A_R/q_i)$] is the elasticity of own output with respect to rivals' advertising and ϵ_{RA} [$= (dA_R/dA_i).(A_i/A_R)$] is the elasticity of rivals' advertising with respect to own advertising (see Waterson, 1984, for more details).

In the absence of strategic response (where $\epsilon_{RA} = 0$) and no rival advertising effects on own output (where $\epsilon_{qR} = 0$) the cyclical nature of the advertising-sales ratio is dependent on the price-cost margin and on ϵ_{qA} (which is > 0). As most empirical evidence suggests that price-cost margins are procyclical[61], A_i/Pq_i is predicted to rise in booms and fall in recessions. Only if strategic aspects are very important (with ϵ_{RA} and/or ϵ_{qR} being negative)[62] is this pattern likely to be offset.

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[61]Machin and Van Reenen (1993) is a recent firm-level study of the behaviour of firm-level margins that strongly draws this out.

[62]Both are perfectly possible: ϵ_{RA} may be negative if advertising acts as a strategic substitute; ϵ_{qR} will be negative if, following Friedman (1983), advertising is predatory (i.e. an increase in advertising by firm i reduces firm j's output).

What this discussion illustrates is that, even in the context of this simple model, to properly evaluate the mechanisms that drive the cyclical evolution of advertising intensities requires a lot of information on firms and their rivals. Typically this is not available. Indeed, the existing literature which attempts to ascertain the cyclical behaviour of advertising usually proceeds by regressing a measure of advertising (usually at industry level) on some kind of cyclical indicator. This clearly does not allow one to say anything about the mechanisms that generate any observed cyclical behaviour. In this study, a different approach has been adopted by directly questioning managers on what they expect to do under boom and recession conditions. This provides a very useful counterpoint to the usual regression based approaches.

There also exists a potential for asymmetric cyclical effects as models can be developed (e.g. based on switching costs, see Klemperer, 1987, or Beggs and Klemperer, 1992) in which firms would upgrade advertising expenditure in cyclical expansions, with no reaction in recessions. The reason for this is that, in a dynamic environment, it may be costly to re-implement the advertising in better times. The cyclical behaviour of advertising is explored below, drawing on managerial responses of what they anticipate their advertising actions to be in a boom or recession, to shed some new light on the cyclical evolution of advertising and on the potential for asymmetric effects.

8.3 DATA DESCRIPTION

As has been discussed earlier in the thesis, there is an important issue of how valuable the responses obtained from advertising managers are likely to be vis-a-vis 'hard'

economic data. The view taken here is that they provide a useful and valuable source of data for at least two reasons. First, it is not possible to obtain precise measures of what we want to consider, namely information on advertising strategies at company-level, from existing information on advertising by UK companies. This is very important given both the lack of UK advertising data discussed above and also the fact that data which does exists is highly likely to be subject to measurement error. Moreover, given the discussion above about potential lags in developing rivalrous advertising strategies, even if good quality, high-frequency firm-level economic data existed, it is not clear how a test of strategic advertising behaviour would be formulated. The approach of questioning managers, whilst not without its own set of problems, is much more direct and provides a very valuable way of looking at strategic aspects of advertising. Second, and related to this, the managerial responses are valuable in their own right as they (ideally) reflect what managers actually think about their advertising behaviour.

The principal objective of this chapter is to study how firms interact with their competitors and how they vary their advertising in response to various cyclical shocks. Considering first the strategic interaction with competitors, the questions to be considered are 11c and 11d. These asked managers if they would respond to an increase or decrease in advertising by competitors by increasing, decreasing or leaving unchanged their own advertising.

Responses to these questions were received from 232 managers who said that they advertise and these are summarised in Table 8.1. The majority (71.6%) state that

they would not respond to an increase by rivals in either direction. Sixty three companies state that they would respond to an increase by rivals by increasing their own advertising, whilst only two say they would respond with a decrease. On the other hand, only six companies say they would follow a decrease by rivals by decreasing advertising themselves.

Thus, the dominant strategy is not to respond to changes in advertising by rivals. Where there is a response, advertising tends to be used as a strategic complement ($dA_i/dA_j > 0$). However, this effect is restricted to the case of rivals increasing advertising. This asymmetry is not unlike that of the kinked demand curve type of pricing strategies where rivals match competitors' price decreases but not their increases (see Hall and Hitch, 1939; Reid, 1981; Bhaskar, Machin and Reid, 1991). This asymmetry is explored in more detail below.

The second set of questions which is of interest here are those regarding responses to cyclical shocks. Questions 9a and 9b asked managers whether a recession or boom would cause them to increase, decrease or leave unchanged their advertising.

Responses to these questions by those who said they advertise are laid out in Table 8.2. Just under a third (32.9%) of managers stated that they would respond to neither recessions nor booms. A further 29% stated that they would follow a procylical pattern - increasing in a boom and decreasing in recession. The implication is that advertising is adjusted passively to demand conditions by these companies. This complements econometric studies that also report a procyclical pattern.

A small minority (10) of companies seem to pursue anti-cyclical advertising policies - increasing in recessions and decreasing in booms - presumably seeking to use advertising to buck the recession and then compensating in booms. Once again, however, there is a marked asymmetry in the perceived reactions. Fourteen firms state that they would react anti-cyclically in a recession whilst not responding to a boom. A further 43 firms state that they would increase advertising in response to a boom, whilst not decreasing in a recession.

It is, of course, possible that the seeming upward asymmetry to both sets of questions is the result of the timing of the survey. In the summer of 1992, the economy was still in the middle of a fairly deep recession, and it may have been that advertising was already at such a low level that managers would not conceive of reducing it further. Question 3 of the survey does provide a cross check by asking managers whether the amount spent on advertising had increased, decreased or stayed the same since 1985.

Table 8.3 summarises responses to this question for those companies indicating upward asymmetrical responses to the rival and cyclical questions. If answers had been affected by the timing of the questionnaire, more of these firms would be expected to have decreased advertising in recent years. In fact the reverse is true. Whereas 29% of all firms stated that they had decreased advertising since 1985, the corresponding figure for the firms who responded asymmetrically to the rival question is only 8%. For the recession/boom question the figure is 15%.

It should be noted that the nature of the questions asked may lead advertising managers in certain types of firms to give similar answers. For instance, companies which leave their advertising unchanged in booms or recessions may simply be those in which advertising is not particularly important. Or it may be that companies do not expect to change advertising expenditures by much if they face little competitive pressure. Further, companies may not respond to rivals' changes in advertising if there are a large number of competitors in their market. Put differently, the asymmetries in responses to rivals and the apparent cyclical nature of advertising may be attributable to observable characteristics of companies and/or their operating market. Hence, the next two Sections of the chapter explore this in more detail and present various econometric models of the determinants of strategic and cyclical asymmetries.

8.4 ECONOMETRIC MODELS OF ADVERTISING BEHAVIOUR

8.4.1 The Determinants of Strategic Advertising Behaviour

There are N responses available (= 232 in Table 8.1 and, due to some missing values on explanatory variables, = 206 for the empirical work below) on the questions relating to managers' perceived actions if rivals change their advertising. Each firm is associated with two responses, one to the rival decrease and one to the rival increase question. The data are thus pooled to give a sample of 2N data points (2 for each firm) on which we can carry out various empirical tests related to firm advertising strategies.

8.4.2 Is Advertising a Strategic Complement or Substitute?

Strategic complementarity (substitutability) suggests that a firm will raise (lower) advertising in response to a rival's increase or lower (raise) it in response to an increase. The nature of the questions in this data means that it is possible to ascertain which of these is the more important by estimating a set of binary probit models which estimate whether or not one observes a positive or negative association between perceived advertising increases (decreases) and rivals' increases (decreases).

For firm i define a variable $\Delta 1\_INC_i$ equal to 1 if firm i's advertising manager responds that he/she would increase advertising in response to competitors' increases or decreases. In an analogous way, two other binary variables are defined as $\Delta 1\_SAME_i$ and $\Delta 1\_DEC_i$ which equal 1 if the manager reports no change or a decrease respectively and 0 otherwise. To carry out the tests, models using these variables as dependent variables are estimated. A test of the statistical importance of advertising strategies that ascertains whether advertising is a strategic complement or substitute is formulated by considering the relationship between the $\Delta 1\_$ variables and a variable UP_i. This is defined as equal to 1 for the N responses to the rivals' increases question and 0 otherwise. The $\Delta 1\_$ variables and UPi are summarised for the 206 firms used in the regressions below in Table 8.4.

A positive coefficient on UP_i on the $\Delta 1\_INC_i$ regression would suggest that a rival increase is likely to lead to the firm increasing advertising. The coefficient can be interpreted similarly in the other two cases.

Given the binary nature of the dependent variables, and the pooling of the data so that

there are two observations per company, random effects probit estimates of the determinants of rivalrous advertising behaviour are presented below.[63] As noted above, one can, however, think of a number of reasons as to why firms with different characteristics may be more or less likely to alter their advertising strategies in response to rivals' changes. To test for the presence of strategic behaviour, the following factors are used as controls:

(i) how much advertising companies do (the advertising to sales ratio, in percentage terms, A/S).

(ii) whether there are 5 or less competitors in the firm's market(s).

(iii) whether one firm dominates advertising in the firm's market(s) (AONE).

(iv) whether a significant proportion (taken here to be 10 percent or more) of the firm's advertisements includes information on prices (PRICE).

(v) product group (consumer goods, consumer non-durable goods and producer goods as compared to others)[64].

Table 8.5 reports a set of probit estimates of the determinants of advertising responses in 206 UK companies, paying particular attention to the direction of responses to rivals' advertising increases/decreases. For each of the three binary dependent variables two specifications are reported. The first is a simple regression on the UP_i variable only, whilst the second is conditional on the characteristics of the firm and its

[63]The random effects part is to allow for the two observations corresponding to each firm to have a correlated error structure and the probit part is due to the discrete (0-1) nature of the dependent variable. The estimation method used is the Butler and Moffit (1982) estimator that is implemented in LIMDEP (see Greene, 1991, Chapter 37).

[64]The other groups are miscellaneous, financial, commodities or utilities.

operating market(s).

In column 1 the estimated coefficient on the rivals' advertising increase dummy variable UP_i is estimated to be positive and statistically significant, suggesting that advertising acts as a strategic complement. In column 2 the variables describing characteristics of firms and their operating markets are included. The estimated UP_i effect remains robust to their addition.

The effect of the UP_i variable is quite sizable: the marginal effect (the partial derivative of $Pr[\Delta 1\_INC_i = 1]$ with respect to UP_i, evaluated at the mean of the regressors) reported at the base of the Table implies that, *ceteris paribus*, managers are some 22 percent more likely to increase advertising in response to a rivals' increase as compared to either leaving it unchanged or decreasing it.

With respect to the other variables, increases in advertising as a response to changes in rivals' advertising also seem more likely to occur in firms for whom advertising is more important (higher AS) and for those in less competitive markets. Furthermore, managers in firms whose advertising contains a significant amount of information on prices are also more likely to increase their advertising. There is no significant role for the structure of advertising in the firm's market (as measured by AONE), nor for the broad industry groups.

However, the appearance of advertising as a strategic complement as suggested by these specifications is not quite as clearly defined as they might first suggest. The

results in columns 3 and 4 examine whether managers who stated that they would not alter their advertising are more or less likely to respond to upward or downward changes. The estimated coefficient on UP_i is negative and significant suggesting that managers are more (less) likely not to alter their advertising if rivals reduce (increase) their advertising.

Finally, in columns 5 and 6 the question of whether the small number of respondents who stated that they would reduce advertising in response to rivals differs with the direction of the rivals' change is explored. As one would expect if advertising acts as a strategic complement, the estimated coefficient is negative but (not surprisingly given the very small proportion who would decrease advertising) is insignificantly different from zero.

Another way to model the pattern of strategic advertising behaviour is to take advantage of the ordered nature of the three categorical responses and to estimate an Ordered Probit model. Doing so produced a significantly positive coefficient on the UP_i variable in specifications with and without controls: the estimated coefficients (and associated standard errors) for the UP_i variable were 0.978 (.152) without controls and 0.986 (.159) when the controls from Table 8.5 were included. Converting to marginal effects for the three outcomes led to the following[65]:

	Rival Increase,	**Rival Increase,**

[65]Marginal effects for Ordered Probit models where the dependent variable is ordered from $y_i = 0, 1, \ldots J$ ($J = 2$ in the reported model) are computed as $\partial Pr[y_i = j] / \partial X_i = [\phi(\Theta_{j-1} - X_i\beta) - \phi(\Theta_j - X_i\beta)]\beta$ where, β is the estimated coefficient on variable X_i, $\phi(.)$ is the standard normal density function and Θ denotes the (estimated) thresholds between the ordered categories.

	No controls	Include controls
Decrease advertising	-0.030	-0.028
No change	-0.187	-0.187
Increase advertising	0.217	0.216

The same pattern as for the three separate probit models emerges. Namely a strong positive probability that managers would expect to increase their advertising in response to a rivals' increase, suggesting strategic complementarity, but less evidence of strategic behaviour with respect to advertising decreases. On balance, there is some evidence of advertising acting as a strategic complement, but also some degree of asymmetrical response. The presence of such an asymmetry is what we turn our attention to next.

8.4.3 Asymmetries in the Use of Advertising as a Strategic Variable

Table 8.6 presents several models of the determinants of rivalrous advertising behaviour in which the potential for asymmetric strategic behaviour is investigated. This is done by defining a symmetric dependent variable, $S1_i$, which equals 1 if managers stated they would increase (decrease) advertising in response to a rivals' increase (decrease) and 0 otherwise. Probit regressions of $S1_i$ on the indicator variable UP_i are then used to test for an asymmetric response.

In column 1 of the Table, the coefficient on UP_i is estimated to be positive and strongly significant. Converting to marginal terms, it suggests that advertising managers are some 24 percent more likely (asymptotic 't' ratio for marginal effect = 7.91) to raise their advertising if their competitors increased their advertising than to decrease their advertising on anticipation of a reduction by their rivals. This draws

out the statistical importance of the pattern displayed in the cross-tabulation of Table 8.1 and suggested by the general probit models of Table 8.5.

The asymmetry suggested by the positive coefficient on UP_i remains robust to the inclusion of the firm and industry characteristics, as reported in column 2. There is some evidence that companies who have a higher advertising to sales ratio (AS) are more likely to match their rivals' advertising increases. This seems reasonable as these companies are presumably those with most to lose if advertising competition becomes more intense. The coefficient on the 'five or fewer competitors in the product market' is estimated to be positive, suggesting that companies in oligopolistic markets are more likely to follow advertising increases by their rivals. The coefficient on the price information variable is positive and significant at the 5 percent level. Thus, it seems that advertisements which include information on prices are particularly sensitive to decisions of rivals. The 'one firm dominates advertising in the market' variable also attracts a positive coefficient, but is not significant (asymptotic 't' statistic = 0.57). In column 3 the product group dummy variables are included. These prove to be jointly insignificant ($\chi^2(3) = 1.32$, 5 percent critical value = 7.81) which provides some additional justification for the inclusion of both producer and consumer firms in the sample.

In the fourth and fifth columns of the Table separate equations for the upward and downward responses are reported (excluding the product group variables which were also jointly insignificant in the two models). The null hypothesis of equal coefficients across the two sub-samples cannot be rejected (a formal Likelihood Ratio test

produced a $\chi^2(4)$ statistic of 4.28 which lies beneath the 5 percent critical value of 9.49). Only one significant difference seems to emerge with the estimated coefficient on PRICE being more strongly positive for downward responses.

The sub-sample models basically suggest a single interaction term (UP*PRICE) is important. This is appended to the full sample model in column 6 of Table 8.6, at the same time dropping the statistically insignificant regressors. The asymmetric pattern predicted by the model in column 6 is:

$$\frac{\partial S1_i}{\partial UP_i} = 1.999 - 0.864.PRICE_i \qquad (8.5)$$

In probability terms this becomes:

$$\frac{\partial Pr[S1_i=1]}{\partial UP_i} = 0.250 - 0.107.PRICE_i \qquad (8.6)$$

This suggests that the asymmetric response is stronger for companies whose advertisements do not include information on prices (though the interaction term is only significant at the 10 percent level). In terms of magnitude, managers in firms whose advertisements convey no price information are some 25 percent more likely (asymptotic 't' = 7.36) to exhibit asymmetric responses and follow advertising increases, but not decreases. On the other hand, where advertisements do convey price information, managers are about 14 percent (asymptotic 't' = 4.97) more likely to do so.

8.5 ECONOMETRIC MODELS OF THE DETERMINANTS OF CYCLICAL

ADVERTISING BEHAVIOUR

8.5.1 The Determinants of Cyclical Advertising Behaviour

The next stage is to analyze the advertising managers' perceived response to business cycle conditions. As in the case of strategic advertising, three binary dependent variables are defined as:

(i) $\Delta 2\_INC_i$ which equals 1 if a manager responded that his/her firm would increase advertising in either a recession or a boom and 0 otherwise;

(ii) $\Delta 2\_SAME_i$ if managers responded they that they would leave advertising unchanged in response to changes in business cycle conditions;

(iii) $\Delta 2\_DEC_i$ which equals 1 if a manager responded that his/her firm would decrease advertising in either a recession or a boom and 0 otherwise.

To test for differences in the boom and recession questions, a dummy variable $BOOM_i$ is defined as equal to 1 for responses to the boom question, and equal to 0 for the recession responses. Considering probit regressions of the $\Delta 2\_$ variables on the BOOM dummy variable enables us to examine whether advertising displays any cyclical behaviour and, if so, in what direction. In a similar way to the previous analysis, a positive coefficient on $BOOM_i$ in the $\Delta 2\_INC_i$ regression would suggest that a boom is likely to lead to a firm increasing its advertising.

A set of specifications investigating the cyclicality of firm-level advertising are reported in Table 8.7. Advertising appears to be strongly procyclical as witnessed by the strongly positive coefficient on BOOM in the increased advertising equations (columns 1 and 2), the insignificant effect in the no change equations (columns 3 and

4), and the strongly negative effect in the advertising reduction equations (columns 5 and 6). The marginal effects are sizable. Advertising increases are, ceteris paribus, some 34 percent more likely in booms whilst advertising decreases are 30 percent less likely to occur in booms.

Of the other variables the only significant determinant of changes in advertising appears to be the firm-level advertising/sales ratio which suggests that firms which advertise more heavily are more likely to raise their advertising in 'good times' to attract new customers. The other variables do not appear to have any significant role. As such, the basic story that emerges from the Table is that advertising at firm-level appears to display a strongly procyclical pattern.

8.5.2 Asymmetries in the Cyclicality of Advertising

To investigate the potential importance of asymmetries, a variable $S2_i$ is defined as equal to 1 if managers stated they would increase advertising in a boom or decrease it in a recession. Hence, it is designed to capture the extent to which advertising strategies are procyclical. The importance of differential effects across the cycle can be tested by seeing whether the $BOOM_i$ dummy variable has an impact on $S2_i$.

Column 1 of Table 8.8 presents a simple probit regression of $S2_i$ on $BOOM_i$. The estimated coefficient on $BOOM_i$ is positive and significant at the 5 percent level. The magnitude of the effect (once converted into marginal terms) suggests that advertising managers are just over 11 percent more likely to expect to increase advertising in booms than to decrease it in recessions. Adding in the market structure and

advertising controls in column 2 does not change this pattern: none have a significant impact at the 5 percent level and the coefficient on $BOOM_i$ is hardly altered, remaining positive and significant, with a marginal effect being estimated at 11.5 percent.[66] Other than the cyclical asymmetry uncovered by $BOOM_i$, the only other variables in the models in columns 2 and 3 that seem to have an impact on the likelihood that a firm pursues procyclical advertising strategies are the industry group dummy variables. More specifically, firms that sell consumer durables seem significantly more likely to have procyclical advertising responses. On the other hand, consumer non-durables companies are less cyclically sensitive.

The presence of cyclical asymmetries is of some interest since it appears that, when times are good, firms are more likely to devote more expenditures towards advertising (presumably in the hope of attracting more customers) but they remain reluctant to lower these expenditures in recessions. This accords with the evidence pointing towards upwards strategic asymmetries reported in the previous Table. It is also in line with the customer markets model developed by Bils (1989), in the context of pricing strategies, where booms are characterised by an influx of new customers to whom firms will try to sell their product.

In columns 4 and 5 estimates of probit models for boom and recession responses separately are reported. As for the strategic advertising responses analyzed in Table 8.6, the null of equal coefficient estimates across the two specifications cannot be

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[66]Of course, this could also have been (approximately) computed from the marginal effects in the binary probit models where the comparable number that emerges is about 12 percent [= {(0.343 - 0.303) / 0.303} x 100].

rejected ($\chi^2(8) = 10.50$, 5 percent critical value = 15.50). Only one effect seems to differ significantly across the two sub-samples, namely the coefficient on the company advertising to sales ratio, which is estimated to be positive in the boom sub-sample, and significantly negative in the recession sub-sample. Therefore, in column 6 the full sample model is augmented by the interaction term $BOOM_i*AS_i$, whilst, at the same time, dropping the insignificant regressors.

In the column 6 model, the $BOOM_i$ term is no longer significant, whilst the interactive $BOOM_i*AS_i$ variable attracts a significant positive coefficient. Thus, evidence of an asymmetric response over the business cycle seems to be restricted to firms which have a relatively high advertising to sales ratio. In the column 6 specification, the estimated impact of the $BOOM_i$ variable is:

$$\frac{\partial S2_i}{\partial BOOM_i} = 0.055 + 0.138.AS_i \qquad (8.7)$$

In probability terms this is:

$$\frac{\partial Pr[S2_i=1]}{\partial UP_i} = 0.021 + 0.054.AS_i \qquad (8.8)$$

According to equation (8.8), a company which spends 1 percent of its sales on advertising is estimated to be 7.5 percent (asymptotic 't' = 1.45) more likely to raise advertising in a boom than reduce it in a recession. At the mean advertising-sales ratio of 1.89 percent, this rises to 12.3 percent (asymptotic 't' = 2.46) and the corresponding figure for a heavy advertisement company with AS = 5 percent is 29.1 percent ('t' = 3.41). As such, it is the more heavily advertising companies that appear to be more concerned with trying to reach new customers by increasing

advertising when times are good than in cutting back on advertising when times are bad.

8.6 CONCLUDING REMARKS

In this chapter some new empirical evidence has been presented on the nature of advertising behaviour. Studies based on econometric specifications of the determinants of advertising tend to proliferate the industrial economics literature. Analysis of data on manager's attitudes towards advertising within their company and with respect to their rivals provides a very useful counterpoint to the more usual kinds of studies of advertising.

The chapter has focused on two specific issues, namely managers' expected responses to changes in the advertising undertaken by their rivals and on their actions regarding advertising in booms and recessions. A number of interesting findings emerge. Firstly, the majority of companies seem not to use advertising in a strategic manner. However, there is evidence that advertising is used as a strategic variable by a significant minority of UK firms. Just over a quarter of advertising managers stated that they would change their advertising in response to changes by rivals. When used as a strategic instrument, advertising seems to be a strategic complement, with rivals increases (decreases) in advertising inducing own increases (decreases). Furthermore, these strategic responses are very asymmetric, with companies being far more likely to react to upward changes to advertising by their competitors than to downward change. Probit estimates of the firms' responses, employing a number of different firm specific controls, provide support for support this conclusion.

On the second issue, a much larger percentage of advertising managers (67 percent) stated that they would alter their advertising behaviour in response to changes in the business cycle. As such, advertising is strongly perceived to be a procyclical variable. This finding, based on actual questioning of managers, provides extremely useful and valuable additional evidence on the cyclicality of advertising. Furthermore, there is again some evidence of asymmetries as companies are more likely to expect to increase their advertising in a boom than to decrease it under recessionary conditions. The probit estimates suggest that this effect is more pronounced for companies for whom advertising is a more important part of their operations. This is consistent with recent models which stress the importance of switching costs where firms may not downgrade their advertising in recessions because it would be costly to re-implement in better times.

Table 8.1: Responses to Perceived Changes in Advertising by Competitors

	Response if Competitors Decrease Advertising			
	Increase	No change	Decrease	Total
Response if Competitors Increase Advertising				
Increase	7	50	6	63
No change	1	166	0	167
Decrease	2	0	0	2
Total	10	216	6	232

Notes:
1. Based on 232 firms who stated that they do advertise and who responded to both questions.

Table 8.2: Responses to Perceived Changes in Cyclical Conditions

	Response in Advertising if in Recession			
	Increase	No change	Decrease	Total
Response in Advertising if in Boom				
Increase	9	34	68	111
No change	14	78	21	113
Decrease	10	3	0	13
Total	33	115	89	237

Notes:
1. Based on 237 firms who stated that they do advertise and who responded to both questions.

Table 8.3: Changes in Advertising Since 1985

	Increase	No Change	Decrease	Total
All firms	103 (46%)	56 (25%)	66 (29%)	225 (100%)
Increase in response to rival increase; no change in response to decrease	29 (63%)	9 (20%)	8 (17%)	46 (100%)
Increase in a boom; no change in recession	21 (62%)	8 (24%)	5 (15%)	34 (100%)

Table 8.4: Summary of Firm Responses

Firm's Change Rival's Change	Increase ($\Delta 1\_INC_i$)	No Change ($\Delta 1\_SAME_i$)	Decrease ($\Delta 1\_DEC_i$)
Increase ($UP_i=1$)	58	146	2
Decrease ($UP_i=0$)	10	190	6

Table 8.5: Probit Models of Perceived Responses to Rivals' Changes in Advertising

	Would Increase Advertising		Would not Change Advertising		Would Reduce Advertising	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-1.845 (.149)	-2.220 (.303)	1.570 (.128)	2.058 (.284)	-1.893 (.177)	-2.334 (.609)
UP	1.221 (.175)	1.256 (.178)	-.982 (.158)	-1.073 (.164)	-.444 (.317)	-.511 (.390)
A/S		.058 (.029)		-.085 (.028)		.106 (.052)
Five or fewer competitors		.359 (.209)		-.372 (.202)		.117 (.561)
AONE		.067 (.260)		.030 (.256)		♥
PRICE		.328 (.185)		-.520 (.176)		.873 (.386)
Consumer Durables		.086 (.341)		-.211 (.320)		.323 (.624)
Consumer Non-Durables		.150 (.285)		.010 (.274)		♥
Producer goods		-.042 (.285)		.023 (.271)		-.048 (.599)
Marginal effect (standard error) for UP	.227 (.031)	.221 (.030)	-.219 (.034)	-.217 (.032)	-.019 (.012)	-.001 (.007)
Log-likelihood	-162.6	-157.9	-180.7	-170.8	-38.4	-26.4
N	412	412	412	412	412	412
Mean Dependent Variable	.168	.168	.813	.813	.019	.019

Notes:

1. The dependent variable equals 1 if advertising managers stated that they would alter their advertising upwards (columns 1 and 2), leave it unchanged (columns 3 and 4) or reduce it (columns (5 and 6) in response to an upward/downward shift in their competitors' advertising and 0 otherwise.
2. Random effects probit coefficient estimates (standard errors in parentheses).
3. ♥ denotes the variable has no variation and is thus omitted.
4. For a probit model of the form $y_i = \Phi(X_i\beta)$, marginal effects are computed as $D_i = \partial\Phi(X_i'\beta) / \partial X_i$ with associated standard errors computed using the "delta" method as $[(\partial D_i/\partial\beta)\mathrm{Var}(\beta)(\partial D_i/\partial\beta)']^{1/2}$ where $\Phi(.)$ denotes the standard normal distribution function evaluated at the mean of the independent variables.

Table 8.6: Tests for the Presence of Asymmetric Strategic Advertising Behaviour

	Pooled Sample			Upward Change	Down Change	Pooled
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-2.002 (.178)	-2.610 (.236)	-2.453 (.333)	-.973 (.142)	-2.763 (.419)	-2.958 (.367)
UP	1.405 (.199)	1.579 (.218)	1.579 (.221)			1.999 (.369)
A/S		.081 (.030)	.085 (.030)	.064 (.036)	.099 (.055)	.081 (.030)
Five or fewer competitors		.491 (.220)	.485 (.221)	.534 (.249)	.305 (.561)	.509 (.224)
AONE		.153 (.271)	.146 (.273)	.424 (.218)	♥	
PRICE		.593 (.190)	.551 (.194)	.424 (.218)	1.114 (.441)	1.253 (.453)
Consumer Durables			.065 (.339)			
Consumer Non-durables			-.183 (.292)			
Producer goods			-.224 (.289)			
UP*PRICE						-.864 (.483)
Marginal effect (standard error) for UP	.241 (.030)	.227 (.029)	.227 (.030)			.223 (.031)
Log-likelihood	-150.3	-140.1	-139.6	-117.3	-20.7	-138.8
N	412	412	412	206	206	412
Mean Dependent Variable	.158	.158	.158	.286	.029	.158

Notes:

1. The dependent variable equals 1 if advertising managers stated that they would alter their advertising upwards/downwards in response to an upward/downward shift in their competitors' advertising and 0 otherwise.
2. As for Table 8.4 notes 2 to 4.

Table 8.7: Probit Models of Perceived Responses to Changes in Business Cycle Conditions

	Would Increase Advertising		Would not Change Advertising		Would Reduce Advertising	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-1.077 (.109)	1.153 (.239)	-.012 (.087)	-.018 (.208)	-.419 (.089)	-.286 (.250)
Response to boom conditions	1.004 (.139)	1.019 (.141)	-.036 (.124)	-.038 (.125)	-1.589 (.173)	-1.547 (.174)
A/S		.056 (.026)		-.029 (.025)		-.021 (.031)
Five or fewer competitors		.074 (.188)		-.004 (.170)		-.179 (.218)
AONE		-.079 (.226)		.033 (.205)		.014 (.256)
PRICE		.097 (.162)		.031 (.151)		-.141 (.189)
Consumer Durables		.132 (.289)		-.450 (.266)		.368 (.316)
Consumer Non-durables		-.108 (.242)		.248 (.219)		-.310 (.277)
Producer Goods		-.118 (.238)		.039 (.213)		.063 (.265)
Marginal effect (standard error) for UP	.339 (.046)	.343 (.046)	-.015 (.049)	-.015 (.050)	-.303 (.034)	-.302 (.034)
Log-likelihood	-226.2	-222.7	-285.4	-279.4	-172.7	-168.9
N	412	412	412	412	412	412
Mean Dependent Variable	.305	.305	.488	.488	.208	.208

Notes:
1. The dependent variable equals 1 if advertising managers stated that they would alter their advertising upwards (columns 1 and 2), leave it unchanged (columns 3 and 4) or reduce it (columns (5 and 6) in response to an upward/downward shift in their competitors' advertising and 0 otherwise.
2. As for Table 8.3 notes 2 to 4.

Table 8.8: Testing for the Presence of Asymmetries in Advertising Responses to Cyclical Conditions

	Pooled Sample			Upward Changes	Down Changes	Pooled
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-.371 (.089)	-.292 (.109)	-.198 (.209)	.073 (.281)	-.152 (.287)	-.051 (.212)
BOOM	.293 (.125)	.294 (.125)	.297 (.128)			.055 (.157)
A/S		-.019 (.025)	-.013 (.026)	.045 (.035)	-.099 (.044)	-.091 (.042)
Five or fewer competitors		.091 (.171)	.076 (.172)	.131 (.242)	.006 (.248)	
AONE		-.051 (.207)	.020 (.209)	-.067 (.293)	.126 (.305)	
PRICE		-.222 (.151)	-.238 (.157)	-.088 (.215)	-.473 (.237)	-.252 (.157)
Consumer Durables			.612 (.266)	-.271 (.302)	.832 (.381)	.625 (.268)
Consumer Non-durables			-.398 (.222)	.448 (.379)	-.355 (.325)	-.401 (.223)
Producer Goods			-.098 (.214)	-.461 (.311)	.079 (.310)	-.096 (.215)
BOOM*AS						.138 (.054)
Marginal effect (standard error) for BOOM	.114 (.049)	.115 (.049)	.116 (.050)			.123 (.050)
Log-likelihood	-277.0	-275.4	-264.6	-136.8	-122.5	-261.3
N	412	412	412	206	206	412
Mean Dep Vble	.417	.417	.417	.471	.364	.417

Notes:
1. The dependent variable equals 1 if advertising managers stated that they would alter their advertising upwards/downwards in response to a boom/recession and 0 otherwise.
2. See notes 2-4 of Table 8.4.

Chapter 9

CONCLUSIONS

9.1 SUMMARY OF FINDINGS

In recent years, the industrial economics literature has seen an explosion of work building and extending theoretical models of advertising. The main motivation for this study was to improve the understanding of the economics effects of advertising from an empirical point of view. Related to this was the aim of collecting useful data on advertising at the level of the firm. This it has done: information of both a qualitative and quantitative nature has been gained from a wide range of firms covering all sectors of the economy. There are both problems and advantages with survey data. For example, when using postal surveys, it is difficult to eliminate all selection bias. Further, the reliability of the data depends on the care and accuracy with which the questionnaire is filled in. On the other hand published data does not always lend itself to the analysis of oligopolistic behaviour and may be subject to its own measurement errors. In any case, the debate is something of an empty box in the context of the UK where published data is sparse to say the least.

The data collected here has been used to revisit several areas of debate in the existing literature. In addition, new areas of research have been identified and analyzed. Chapter Four provided support for previous studies linking market structure and advertising. In particular, advertising intensity seems to be highest in oligopolistic situations in which firms are aware of, and likely to react to, rivals. This complements the results of studies which use market concentration data and provides a

more precise insight into the implications of highly concentrated markets.

Chapter Five discussed the key question of the effect of advertising on firm performance. It is clear that the problem of two-way causation is unlikely ever to be completely resolved. However, an array of indicative evidence is presented to suggest that advertising increases monopoly profits for firms working in consumer industries. There seems to be a stronger link between advertising and profitability in the future compared to that in the past. Further, absolute advertising expenditure seems a better predictor of profitability than advertising intensity, which is consistent with market power effects.

The link between profits and advertising has been interpreted by some as simply due to accounting methods. In particular, the treatment of advertising as a current expense rather than an investment may lead to biased estimates. However, in this data, the way in which advertising is treated was found to have no impact on the conclusions drawn under very plausible assumptions.

These results are backed up by the finding that firms that do not advertise are more likely to go into receivership than others (although the small sample size makes this result somewhat tenuous). The data analyzed here is consistent with the theory that advertising can work persuasively in consumer industries.

A subset of the sample, for which time series data is available, was used in Chapter Six to revisit the question of the durability of advertising. Previous work attributing

advertising effects on sales to firm specific factors, such as product quality, are found to be deficient. In the first place, some authors have failed to correct for biases due to the nature of dynamic panel data. Correcting for these biases does not alter previous conclusions that measured advertising effects do not, typically, last longer than one year. Secondly, however, advertising itself seems to play a large part in explaining firm specific effects. At the same time, a proxy variable (albeit an imperfect one) for product quality has little explanatory power. The conclusion of Chapter Seven is that high advertising by a firm, and which tends to be persistent over time, does impact on sales. As common experience, but not some economic theories, might suggest, high levels of advertising do not simply reflect high product quality.

Following on from the study of advertising and firm performance, the extent to which price information is included in advertisements was discussed in Chapter Seven. This can be considered to be a key (although possibly ambiguous) indicator of the welfare effects of advertising. For the first time, systematic evidence on its prevalence has been presented. The most notable feature is that most firms do not advertise prices at all. This is true even within the service sector which has been the focus of attention for a good deal of previous work on price advertising. Those firms which do provide price information are concentrated in consumer markets and tend to have many competitors.

Lastly, the picture emerging from Chapter Eight is that advertising is used strategically by a significant minority of firms. Again, the survey data complements other approaches, in particular game theoretic work such as that by Friedman (1983)

and Slade (1995). Some firms are aware of their rivals and are likely to respond to actions taken by them. Interestingly, there seems to be a significant asymmetry in that firms are much more likely to increase advertising in response to an increase by rivals than to decrease in response to rivals decreasing. Similarly, although the dominant response to changes in business conditions is a pro-cyclical one, firms are more likely to increase advertising in a boom than to decrease it in a recession. Here is yet more evidence that advertising is not always being undertaken simply to minimise transactions costs through providing useful information. For some firms at least, advertising may be a means of competing with rivals to claim a larger share of monopoly rents. Indeed, this is a common conclusion which is at least suggested by many of the results of this thesis.

The findings here emphasise the fact that empirical research still has many important things to say about advertising. In particular, the debate about its effects on welfare is still of great relevance. If nothing else, this study has emphasised the need for good quality data on advertising to complement the vast array of theoretical models that continue to be developed in the area. One obvious step forward would be to force firms to disclose their advertising expenditure.[67] Indeed there is no reason why economists on both sides of the advertising debate, as well as the advertising industry itself should not agree on this course of action. If advertising promotes competition, useful information and efficiency, there seems no harm in the researchers, regulators and the public knowing who spends what. If advertising leads to allocative

[67]This step was taken in the US in the June 15, 1994 guidelines on company accounts.

inefficiency and wasted resources, then the more that is known about it, the better.

9.2 FUTURE WORK

Assuming that the above plea for compulsory disclosure of advertising expenditure goes unheeded, future empirical work in the area must consider the question of data availability. Although they have their drawbacks, surveys can provide a useful source of firm level data. In addition they provide perhaps the only way of accessing managers' perceptions of what they are doing. Thus, there seems to be scope for a larger scale survey of firm advertising, carried out at regular intervals.

It would be of particular interest to develop a longer time series of data for a greater number of firms than that contained in the data set discussed here. In addition, given ongoing European integration, it would seem appropriate to widen the focus to look both at other countries and at cross-country operations. Further, the transition of former Eastern Block countries towards more market-based economies provides ready made case studies for the role of advertising. Does it aid the development of new markets and improve their efficiency, or does it provide a means for large multinationals to gain dominance of the new markets over new and smaller firms?[68]

The increasing globalisation of markets, along with ever improving communication, suggest that the importance of mass media advertising is not likely to decline over the next few years. The advertising industry will continue to take up a significant proportion of most countries' GDP. The question of whether these resources are

[68]For a discussion of advertising in relation to Eastern Europe see Paton (1996).

being used in order to gain monopoly rents or else to improve the flow of information between firms and consumers is as relevant now as it ever was.

Appendix 1

DATA DESCRIPTION AND SOURCES

The data used in the thesis is derived from the three main sources. The first is the 1992 Advertising and Industry Survey. A copy of the questionnaire is given in Appendix 2. This is linked in to company level data derived from the Microexstat and FAME databases. Lastly, each firm is categorised into one (or more) SIC 3-digit industry and corresponding data is collected from the Business Monitor and Census of Production.

A more detailed description of the construction of the variables used in each chapter, as well as the sample mean in each case, now follows.

Chapter Four

SURVEY VARIABLES

Advertiser: is a dummy variable constructed as = 1 if the firm indicated that it advertised; = 0 otherwise. The source is Question 1 of the survey. Firms who indicated that they do not currently advertise, but had done so in the past are counted as advertisers for the purpose of this variable.

Advertising Intensity (A/S): the percentage of sales spent on advertising. The source is Question 2 of the survey. If the firms gave a precise figure, this is used. If the firm indicated one of the given ranges, the mid-point of the range was used. Thus all those ticking the range 0 - 0.5% are counted as having an advertising intensity of

0.25%.

Potentially, this procedure presents us with an estimation problem. A proportion of the observations are categorical rather than continuous responses. In these cases OLS estimates of the determinants of A/S may be biased. One way of measuring the upper limit of this bias is to place each of the continuous responses into one of the ranges and to find ordered probit estimates. In actual fact, the results from using this procedure are little different to those from using OLS. To take an illustrative example, column 4.3 from Table 4.3 was re-estimated using ordered probit. In order to avoid threshold heterogeneity problems, only five categories are used: 0 and up to 0.5%; 0.5% and below 1%; 1 and below 2%; 2 and below 5%; 5% and above. The direction of all the coefficients is unchanged. Significance levels are also similar with the exceptions of the coefficients on Psychological Goods and Log(Age) which are now not significant at the 5% level and that on the Increase in Advertising dummy which is now significant at the 1% level. The probability of being in the 5%+ category is increased by about 15% when React1 = 1 (compared to React1 = 0), decreased by about 7% when React2 = 1 and increased by about 7% when the firm has between 5 and 10 competitors. Given these results and also the loss of potentially important information inherent in the ordered probit procedure, the use of all the data as if it were continuous seems justified.

Decrease in a Recession: a dummy variable = 1 if the firm stated that it would decrease advertising during a recession; = 0 otherwise. The source is Question 9 of the survey.

Recent increase in advertising: a dummy variable = 1 if the firm stated that it has increased advertising since 1985; = 0 otherwise. The source is Question 3 of the survey.

Rank of Advertising: the three dummy variables are constructed as = 1 if the firm ranked advertising as the 1st, 2nd and 3rd respectively most important form of competition in their market; = 0 otherwise. The source is Question 10 of the survey.

Percentage of Advertisements Aimed at Final Consumers (% Consumer): Question 8 asked firms to rank nine media in order of spending on advertising in each. "Trade Press" advertising is assumed to be aimed exclusively at producers and given a score of 0%. "TV" and "Cinema" are assumed to be aimed exclusively at consumers and given a score of 100%. Other media are assumed to be a mixture of the two and given a score of 50%. Each media is then give a weighting as follows. The media ranked first is allocated a score of 9, the second 8, the third 7 and so on. The weight for each media is given by the score for that media divided by the total score of all the media selected. % Consumer is then calculated as the weighted mean of the scores of each media.

The dummy variables indicating the number of competitors are defined as follows:

0-5 Competitors: = 1 if the firm indicated that it faced between 0 and 5 competitors; = 0 otherwise.

5-10 Competitors: = 1 if the firm indicated that it faced between 5 and 10

competitors; = 0 otherwise.

The source for these two variables is Question 11a of the survey.

Advertising Reactions: companies were asked how they would react to changes in their competitors reactions.

React1 = 1 if the firm indicated they would react in some way to a change in rival's advertising; = 0 otherwise.

React2 = 1 if the firm indicated they would follow an increase by increasing advertising but not react to a decrease; = 0 otherwise.

The source for these two variables is Question 11c and 11d of the survey.

FIRM VARIABLES

Sales: total sales in £million during 1992 by firm i. Taken from Microexstat and FAME databases.

Profit Rate: is the price-cost margin for each firm in 1991. This is calculated as [pre-tax profit/sales], which is equivalent to the price-cost markup assuming constant returns to scale. Taken from the Microexstat database.

Age: age of the firm in years at 1992. Taken from the FAME database.

Firm Sales Growth: percentage growth in firm sales from 1991 to 1992, using 1991 as the base year. Calculated from Microexstat and FAME databases.

INDUSTRY VARIABLES

Three dummy variables which divide the firm into their broad area of production are constructed as follows:

> **Consumer non-durables:** is a dummy variable constructed as = 1 if the firm produces mainly non-durable goods for final consumers; = 0 otherwise.
>
> **Consumer durables:** is a dummy variable constructed as = 1 if the firm produces mainly durable goods for final consumers; = 0 otherwise.
>
> **Producer:** is a dummy variable constructed as = 1 if the firm produces mainly for final producers; = 0 otherwise.

Generally Microexstat definitions are used. Thus if the Microexstat industry number of the firm is between 35 and 43, it is categorised as Consumer Non-durables. If it is between 45 and 65, they are categorised as Consumer Durables. If the number is between 11 and 34, they are categorised as Producer. In some cases, where the Microexstat industry number is within some other range but the information given by the firm provides additional information, the firm is placed into the appropriate category above.

Psychological = 1 if the firm's main area of production is pharmaceuticals, cosmetics or toys; = 0 otherwise. This is similar to "personal goods" dummy variable

constructed by Buxton et al (1984).

For the variables based on SIC data, firms were allocated an SIC three-digit industry according to their primary area of activity from the Microexstat database. Where more than one three-digit industry was given, the arithmetic mean of the figures for each of the industries is calculated. In two cases (SIC 328 and SIC 345), the definition is considered too broad and the four-digit level is used.

Industry Share: calculated as Firm Sales divided by Industry Sales in 1991. Industry sales are at the three digit industry level and are taken from Census of Production Summary Volume, PA1002, HMSO.

Industry Growth: Percentage growth in industry sales from 1989 to 1991 using 1989 as the base year. The source is as for Industry Sales.

CR 5: SIC three-digit industry, five-firm concentration ratio. For manufacturing industries the source is the Census of Production Summary Volume, HMSO. For other industries (for example, some retailing trades) for which concentration ratios are also produced, various parts of the Business Monitor are used.

Imports: percentage of industry sales which are imported. Calculated as (Industry Imports) divided by (industry sales + industry imports - industry exports) times 100. Taken from Business Monitor MQ10, HMSO.

The mean value of each variable is given in Table A1.1. In the first half of the table, means are given for the sample used in the probit analysis for both advertisers and non-advertisers. The second half of the table gives the mean values for variables used in the analysis of advertisers, for both the whole sample and the sub-sample for which concentration data is available.

A breakdown of advertising intensity by Microexstat industry and by SIC two-digit industry is given in Tables A1.2 and A1.3 respectively. In each case a figure is only reported where there are five or more observations for that industry.

The additional variables used in the other chapters are described below.

Chapter 5

SURVEY VARIABLES

Consumer: is a dummy variable constructed as = 1 if the firm produces mainly for final consumers; = 0 otherwise.

Advertising (A): is total advertising in millions estimated as A/S multiplied by 1992 firm sales. For firms who answered Question 12, this figure was compared with the figure provided by the firm for total advertising expenditure in 1991. In the few cases where there was a large difference between the two figures not explained elsewhere in the survey, the figure provided by firm for 1991 was used in preference to the calculated one.

Decrease Adv: is a dummy variable equal to 1 if the firm indicated that it had decreased advertising since 1985; = 0 otherwise. The source is Question 3 of the survey.

FIRM VARIABLES

Profit Rate 1993/1991: are calculated as described for Profit Rate in 1992 above.

Change in Profits 89-91: is calculated as (Pre-tax profits in 1991 - Pre-tax profits in 1989) divided by the absolute value of Pre-tax profits in 1989. The source is the Microexstat database.

Assets 1993/1991: is Net Fixed Tangible Assets in 1993 and 1991 respectively. Taken from the Microexstat and FAME databases.

Assets/Sales 1993: is Assets 1993 divided by Sales 1993.

Exit: is a dummy variable constructed as = 1 if the firm went into 'receivership' or 'liquidation' between the date of the survey and the end of 1995. The definitions of 'Receivership' and 'Liquidation' are taken from "The Guide for Creditors" (undated) published by The Insolvency Service. The source is the FAME database.

INDUSTRY VARIABLES

1992 values are used as 1993 data was not available at the time of the study.

Industry Share 92, Import Intensity 92 and Industry Growth 90-92: are all calculated as described for earlier years in Chapter 4.

Table A1.4 lists the means of each variable for the samples used in Chapter 5. In each case, the sample is split into 'consumer' and 'other' firms using the Consumer dummy variable described above.

Chapter 6

SURVEY VARIABLES

Advertising (A): for the years 1984 - 1991, is taken from answers given to Question 12 of the survey, measured in £million. Figures for 1992 are estimated as (A/S) x (Sales in 1992) divided by 100. In a few cases, there is a large discrepancy between the estimated 1992 figure and that given for 1991. Where this is not explained by other information given in the survey, the 1992 observation is discarded.

Media Dummies: are constructed as = 1 if the firm indicates that it spends most on the relevant media; = 0 otherwise. The source is Question 8 of the survey.

Quality Important: is a dummy variable constructed as = 1 if the firm indicates that quality is one of the three most important form of competition in their market; = 0 otherwise. Separate dummy variables for the different rankings of quality were experimented with, but added little to explanatory power of the regressions. The source is Question 10 of the survey.

FIRM VARIABLES

Employment: is the total number of employees for each firm, measured in thousands. The source is the FAME database.

The means of the variables used in the panel data analysis are reported in Table A1.5a. Table A1.5b reports the means of the firm specific variables used in the analysis of the fixed effects.

Chapter 7

SURVEY VARIABLES

Price Information: is the percentage of advertisements which provide specific price information, as indicated by the firm. This is an ordered categorical variable. Initially it takes the five values given in the questionnaire. As described in the text, the 10-50% and 50-75% categories are then collapsed to give four values. The source is Question 7 of the survey.

More than 10 Competitors: is a dummy variable constructed as = 1 if the firm indicated that it faced more than 10 competitors; = 0 otherwise.

Price Important: is a dummy variable constructed as = 1 if the firm indicates that price is one of the three most important form of competition in their market; = 0 otherwise. Again, separate dummy variables for the different rankings of price were experimented with, but added little to explanatory power of the regressions. The source is Question 10 of the survey.

INDUSTRY VARIABLES

Distributor: is a dummy variable constructed as = 1 if the firm operates mainly in industries concerned with distribution; = 0 if either manufacturing or services. The source is ELC International's "UK's 10,000 Largest Companies 1992", ELC Publishing: London. The division of firms into distribution, manufacturing and services in this source is also used to construct Table 7.2.

The means of the each of the variables used are shown in Table A1.6.

Chapter 8

SURVEY VARIABLES

Rival Response Dummy Variables:

Δ1_INC: is a dummy variable constructed as = 1 if the firm indicates that it would increase advertising in response to competitors' increases or decreases; = 0 otherwise.

Δ1_SAME: is a dummy variable constructed as = 1 if the firm indicates that it would not change advertising in response to competitors' increases or decreases; = 0 otherwise.

Δ1_DEC: is a dummy variable constructed as = 1 if the firm indicates that it would decrease advertising in response to competitors' increases or decreases; = 0 otherwise.

UP: is a dummy variable constructed as = 1 for the responses to the rivals' increases question; = 0 for the responses to the rivals' decreases question.

S1: is a dummy variable constructed as = 1 if the firm indicates that it would

increase (decrease) advertising in response to a rival's increase (decrease); = 0 otherwise.

The source for these variables is Question 11c and Question 11d of the survey.

Cyclical Condition Dummy Variables:

Δ2_INC: is a dummy variable constructed as = 1 if the firm indicates that it would increase advertising in either a recession or a boom; = 0 otherwise.

Δ2_SAME: is a dummy variable constructed as = 1 if the firm indicates that it would leave advertising unchanged in response to changes in business cycle conditions; = 0 otherwise.

Δ2_DEC: is a dummy variable constructed as = 1 if the firm indicates that it would decrease advertising in either a recession or a boom; = 0 otherwise.

BOOM: is a dummy variable constructed as = 1 for responses to the boom question, and ; = to 0 for the recession responses.

S2: is a dummy variable constructed as = to 1 if the firm indicates that it would increase advertising in a boom or decrease it in a recession; = 0 otherwise.

The source for these variables is Question 9 of the survey.

AONE: is a dummy variable constructed as = 1 if the firm indicates that advertising in their market is dominated by one firm; = 0 otherwise. The source is Question 11b of the survey.

PRICE: is a dummy variable constructed as = 1 if the firm indicates that either 10-

50%, 50-75% or 75-100% of their advertisements contain price information; = 0 otherwise. The source is Question 7 of the survey.

The means of the dependent variables used are given in Table A1.7.

Table A1.1: Means of Variables Used in Chapter 4

	All Firms	Advertisers	Non advertisers
Advertiser	0.788	1	0
Consumer Non-durables	0.297	0.317	0.224
Consumer Durables	0.098	0.112	0.045
Producer	0.430	0.449	0.358
Log (sales)	4.34	4.51	3.710
Sales < £90	0.547	0.506	0.701
Sales Growth	10.26	4.92	30.08
N	316	249	67
Industry Growth 89-91	3.71	3.97	2.70
Industry Share 91	12.8	15.05	3.99
N	301	239	62

	All Firms	Concentration Sample
A/S	1.863	1.826
React1	0.258	0.225
React2	0.217	0.223
0-5 Competitors	0.177	
5-10 Competitors	0.172	0.180
% Consumer	37.50	38.84
Psychological	0.036	
Adv Rank 1	0.050	
Adv Rank 2	0.068	
Adv Rank 3	0.149	
Log (sales)	4.420	
Profit Rate	0.037	
Increase Adverts 87-92	0.421	
Decrease in Recession	0.376	
Log (age)	3.201	
CR5		0.392
Industry Share 91		17.92
% Import		32.53
N	221	139

Table A1.2: Mean Advertising Intensity by Microexstat Industry Group

Group No	Industry	A/S	N
14	Building Materials	1.150	5
18	Construction	0.573	22
19	Electricals (Non-domestic)	0.695	10
22	Industrial Plant	0.212	5
27	Mechanical Engineering	0.677	11
35	Electronic Manufacturers	1.704	16
38	Furniture/bedding	1.670	5
45	Breweries	1.911	9
48	Leisure (e.g. cinemas)	1.817	12
49	General Food Manufacturers	2.620	9
53	Publishing & Printing	1.100	8
54	Packaging/paper	0.528	9
58	Multiple retailers	2.472	9
67	Pharmaceutical	3.675	6
68	General Chemicals	1.357	7
70	Oil	0.055	11
72	Transport/freight	1.343	7
73	Industrial Holding Companies	1.186	7
75	Agencies (e.g. employment)	2.406	16
76	Miscellaneous	1.291	16
87	Miscellaneous Financial	1.291	10
	All Companies	1.374	302

Note:
Includes only those groups with five or more observations.

Table A1.3: Mean Advertising Intensity by SIC 2-digit Industry (1980 UK Definition)

Industry No	Industry	A/S	N
13	Mineral oil and gas	0	7
22	Metal manufacture	0.229	7
24	Man. of non-metallic prods.	0.736	11
25	Chemicals	1.657	18
31	Manufacture of metal goods	0.883	9
32	Mechanical engineering	0.554	15
33	Man. office machinery etc.	1.000	6
34	Electric. and electron. eng.	1.626	20
42	Food drink and tobacco man.	2.188	13
43	Textiles	0.932	11
46	Timber and furniture	0.550	10
47	Printer, paper and publishing	1.665	13
48	Processing of rubber/plastics	1.308	6
49	Other man. industries	6.350	5
50	Construction	0.643	14
61	Wholesale distribution	1.568	17
64	Retail distribution	1.457	7
65	Retail distribution	2.375	8
72	Other inland transport	0.350	5
77	Misc. transport services	3.140	5
81	Banking and finance	0.750	7
83	Business services	1.700	29
85	Owning/dealing in real estate	0.050	5
97	Medical/health services	1.750	9
	All Industries	1.374	302

Note:
Includes only those industries with five or more observations.

Table A1.4: Means of Variables Used in Chapter 5

	All Firms	Consumer Firms	Other Firms
Prof Rate 1993	5.88	6.76	5.30
Prof Rate 1992	5.05	6.72	3.94
A/S	1.41	1.95	1.05
A	3.60	4.90	2.74
Assets/sales 1993	56.49	43.60	64.98
Assets 1993	320.4	289.7	340.72
N	272	108	162
Industry Share 1992	12.62	11.69	13.29
Import Intensity 1992	25.87	26.38	25.48
Industry Growth 1990-92	-0.766	-0.805	-0.736
N	242	108	138
Gross Profit Rate 1993	27.65	21.93	28.98
Gross Profit Rate 1992	22.78	18.67	21.45
N	202	85	117
Exit	0.059	0.069	0.0582
Age	38.14	45.89	32.88
Advertiser	320.5	334.9	310.8
Assets 1991	297.6	308.2	290.5
N	324	131	189
A/S	1.38	1.94	0.994
N	301	121	180
Decrease Adv	0.209	0.213	0.206
Profit Rate 1991	0.416	6.30	-3.54
Change Profit Rate 1989-91	-213.4	-25.98	-339.4
N	316	127	189

Table A1.5a: Means of Variables Used in Chapter 6 (panel data analysis)

Log Sales	4.350
Log A	-1.325
Number of firms	109
Mean Number of Years	4.63
Total Observations	505
First Difference Estimates:	
Log Sales	4.448
Log A	-1.206
Number of Firms	106
Mean Number of Years	3.72
Total Observations	386
Log Employment	6.970
Log Assets	2.846
Number of Firms	105
Mean Number of Years	3.524
Total Observations	347

Table A1.5b: Means of Variables Used in Chapter 6 (analysis of fixed effects)

<u>Advertising Media dummies:</u>	
Television	0.173
Radio	0.019
Poster	0.010
National Press	0.173
Local Press	0.164
Trade Press	0.394
Direct Mail	0.028
Directories	0.039
N	104
Quality Important	0.524
Producer	0.477
Consumer	0.413
Mean Log Tangible Assets	2.599
N	109

Table A1.6: Means of Variables Used in Chapter 7

More than 10 rivals	0.639
Price Important	0.718
Distributor	0.148
A/S	1.813
Increase in a Recession	0.134
% Ads to Consumers	38.02
Consumer Durables	0.125
N	216

Table A1.7: Means of Variables Used in Chapter 8

A/S	1.732
Five or Fewer Competitors	0.174
One Firm Dominates Advertising	0.108
10+% of Adverts Contain Price Information	0.242
Consumer Durables	0.130
Consumer Non-durables	0.300
Producer Goods	0.435
N	206

Note:
The means of each of the dependent variables are given in the tables of Chapter 8.

Appendix 2

ADVERTISING AND INDUSTRY SURVEY

Please answer as many questions as you can. If you feel you are unable to answer a particular question, just move on to the next one.

1. Does your firm advertise?

Yes ____ No____

If the answer to 1. is no, please go to question 6. If the answer to 1. is yes:

2. How much do you currently spend on advertising as a percentage of your sales?____%

2a. If you do not know the percentage, within which range does it lie:

0-0.5%___ 0.5-1.0%___ 1-2%___ 2-3%___ 3-4%___ 4-5%___
5-6%___ 6-8%___ 8-10%___ 10-12%___ 12%+___

3. Allowing for inflation, how has the amount you spend on advertising changed:

since 1985?	Increased____	Decreased____	Same____
from 1980 - 1985?	Increased____	Decreased____	Same____

4. About how many people work in your advertising department?

_____people

5. Which are the main product you advertise?

_____ _____

_____ _____

6. Approximately how many new products have you introduced since 1985? _____

About how many products have you stopped producing since 1985? _____

7. About what percentage of your adverts provide specific information about the price of your product(s)?

0%___ 0-10%___ 10-50%___ 50-75%___ 75-100%___

8.Please rank the following media in order of how much you spend on advertising in each (1 being where most is spent and 10 the least.)

TV ☐

Radio ☐

Poster ☐

Transport (eg on buses or tubes) ☐

Cinema ☐

National newspaper/magazine ☐

Local newspaper ☐

Trade Press ☐

Direct Mail ☐

Other (please specify): ..... ☐

9a. Would a recession cause you to increase, decrease or not change your level of advertising?

Increase ____ Decrease ____ No change ____

9b. Would a boom cause you to increase, decrease or not change your level of advertising?

Increase ____ Decrease ____ No change ____

10. Please rank the following forms of competition according to which you feel is most important in your market (1 being most important and 6 the least):

Price ☐

Quality ☐

Sales effort ☐

Advertising ☐

After sales service ☐

Other (please specify): ..... ☐

11a. How many other firms compete with you in your market(s)?

0 - 5 ____ 5 - 10 ___ Over 10 ____

11b. Does one firm dominate advertising in your market, a few firms or do all firms advertise more or less equally?

One firm ____ Few Firms ____ All Firms ____

11c. If competitors decreased their advertising would it cause you to increase your advertising, decrease it or leave it unchanged?

Increase ____ Decrease ____ No change ____

11d. If competitors increased their advertising would it cause you to increase your advertising, decrease it or leave it unchanged?

Increase ____ Decrease ____ No change ____

Thank you for your help so far. If you have the information available, I would be very grateful if you would also answer one further question.

12. What was your total advertising expenditure in the following years?

Year	Advertising Expenditure (£)
1984	
1985	
1986	
1987	
1988	
1989	
1990	
1991	

THANK YOU VERY MUCH FOR YOUR COOPERATION

Return to: David Paton, School of Economics, Kingston Polytechnic, Penrhyn Road, Kingston KT1 2EE

Appendix 3

RESPONDENTS AND NON-RESPONDENTS

Respondents by Industry

Tables A3.1 and A3.2 give the number of respondents for each Microexstat industry and for each SIC two-digit industry.

Analysis of Non-Respondents

Of the 190 firms who returned blank forms or sent a letter, 109 gave reasons as to why they would not take part. They are summarised into five categories in Table .

It seems reasonable to assume that categories 1 and 2 contain companies who would have taken part in the questionnaire had it been appropriate to them. The implication is that the response rate would have been significantly higher had something been known about the firms beforehand. For example, had all Holding Companies in the sample been replaced by other firms, about another 24 useable responses might have been expected.

Table A3.1: Reasons Given for Not Responding

REASON	EXPLANATION	NUMBER
Information not held at company head office:	Holding company	24
	Advertising decentralised	13
	Advertising undertaken by subsidiaries	21
Questionnaire Inappropriate:	Inappropriate for non-manufacturers	8
	Firm activities too diverse	1
	Firm not representative	1
	Others	7
Company Policy:	Too many questionnaires	6
	Too many and firm too small	1
	Not enough time	2
	Firm too small	1
	To save money	1
	Due to recession	1
	Others	5
No Time		10
Info. Confidential		6

Note:
There was also one response where some information was given, but was considered to be inconsistent.

Table A3.2: Breakdown of Respondents by Microexstat Industry Group

Microexstat Group No	Industry	N	Microexstat Group No	Industry	N
9	Water	4	51	Food Retailing	4
11	Industrial Materials	3	52	Publishing	2
12	Bricks/Roofing Tiles	1	53	Publishing & Printing	8
13	Builders Merchants	1	54	Packaging/Paper	9
14	Building Materials	5	55	Department Stores	4
15	Cement/Concrete	3	56	Furnishing Retailers	1
16	Paint/Chemical Colours	2	57	Mail Order Shops	1
17	Timber	1	58	Multiple Retailers	9
18	Construction	23	59	Clothing Manufacturers	4
19	Electricals (Non-domestic)	11	61	Cotton and Synthetic Fibres	5
21	Various Founding/Stamping	4	62	Other Textiles	2
22	Industrial Plant	6	64	Leather	1
23	Mechanical Handling	2	65	Toys/Games	2
24	Pumps/Valves	3	66	Plastic/Rubber Goods	1
25	Steel/Chemical Plant	1	67	Pharmaceuticals	6
26	Wire Ropes	1	68	Other Chem. M'facturers	7
27	Finished Engineering	12	69	Office Equipment	4
31	Measuring Instruments	3	70	Oil	11
32	Non-ferrous Metal Products	2	72	Transport/freight	8
33	Steel Manufacturers	4	73	Ind. Holding Companies	8
34	Metal Forming	3	74	Laundries/Dry Cleaners	1
35	Electronic Manufacturers	16	75	Agencies(eg employment)	18
37	Floor Coverings	2	76	Miscellaneous	16
38	Furniture/Bedding	5	80	Hire Purchase Finance	1
39	Household Appliances	1	83	Insurance Brokers	4
41	Motor Components	4	86	Property Owners/Develop.	6
42	Garages/Car Hire	3	87	Miscellaneous Financial	10
43	Car Manufacturers	3	96	Mines/Collieries	1
44	Security	2	97	Overseas Trade	1
45	Breweries	11			
46	Wines/Spirits/Off Licences	2		**All Industries**	**324**
47	Hotel/Restaurants	2			
48	Leisure (e.g. cinemas)	14			
49	General Food Manufacturers	9			

Note:
1. N represents the number of firms responding in each industry.
2. The group of one company could not be traced.

Table A3.3: Breakdown of Respondents by SIC 2-digit Industry Group (1980 UK Definition)

Industry No.	Industry	N
11	Coal extraction and manufacture of solid fuels	2
13	Mineral oil and natural gas extraction	7
14	Mineral oil processing	2
16	Production and distribution of electricity, gas etc.	2
17	Water supply	4
22	Metal manufacture	7
23	Extraction of minerals not elsewhere specified	3
24	Manufacture of non-metallic products	11
25	Chemicals	18
31	Manufacture of metal goods	9
32	Mechanical engineering	16
33	Man. of office machinery and data processing equipment	6
34	Electrical and electronic engineering	21
35	Manufacture of motor vehicles and parts	4
36	Manufacture of other transport equipment	5
37	Instrument engineering	2
41	Food drink and tobacco manufacturing (a)	4
42	Food drink and tobacco manufacturing (b)	17
43	Textiles	12
44	Manufacture of leather and leather goods	2
45	Footwear and clothing industries	3
46	Timber and furniture	10
47	Printer, paper and publishing	14
48	Processing of rubber and plastics	6
49	Other manufacturing industries	5
50	Construction	16
61	Wholesale distribution (except scrap and waste materials)	20
64	Retail distribution	7
65	Retail distribution	10
66	Hotels and catering	1
71	Railways	1
72	Other inland transport	5
75	Air transport	1
76	Supporting services to transport	2
77	Miscellaneous transport services and storage	5
81	Banking and finance	7
82	Insurance	5
83	Business services	30
84	Renting of movables	4
85	Owning and dealing in real estate	6
95	Medical and other health services	1
97	Recreation and other cultural services	11
98	Personal services	1
	All Industries	**325**

Note:
N represents the number of firms responding from each industry.

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