Advertising and Firm Performance: Some New Evidence from UK Firms

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Abstract

In this paper we present new evidence on the relationship between advertising and firm performance using UK survey data. Advertising is found to be correlated with profitability for those firms operating mainly in consumer goods industries. We also adopt a new approach, which uses receivership as an unambiguous measure of firm performance, to clarify the direction of causality in the relationship. We find that, within consumer goods industries, firms who advertise are less likely to exit from the market due to receivership than those who do not advertise. The results are consistent with the hypothesis that advertising exerts a significant effect on firm performance.

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, generally restricted to consumer goods industries. Although most of these studies have been at the industry level (see for example, Comanor and Wilson, 1974; Domowitz, Hubbard and Peterson, 1986; Weiss, 1991), the correlation has also been found by US firm level studies such as Hirschey (1985), Megna and Mueller (1991) and Ailawadi, Farris, and Parry (1994). The lack of firm level advertising data in the UK has meant that such studies have rarely been replicated in the UK. This paper is able to investigate the relationship using cross-sectional data from a survey of UK firms carried out in 1992.

The interpretation of this relationship has been the subject of much debate, focusing largely on the direction of causation between the two variables and the consequent implications for public policy. In particular, if advertising allows firms to make monopoly profits, then it can be seen as a cause of allocative inefficiency and as such should be viewed as a potential area for legislation. An alternative view is that high advertising is a consequence of profitability through productive efficiency. Firms producing high quality products (and making greater profits per unit than would be possible for low quality goods) may also advertise more in order to signal this quality (see Nelson, 1974). If so, high levels of advertising are a quality premium rather than indicative of any monopoly power.

Attempts to control for such endogeneity by using simultaneous equation estimation have been proposed by several studies including Comanor and Wilson (1974), Geroski (1982) and Rosenbaum (1993). These have generally confirmed that advertising appears to cause an increase in profitability in consumer industries. However, 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 may tell us very little as the relation between these estimates is entirely determined by the set of variables used as instruments' (p.955).

Two approaches are adopted in this paper. The first is to tackle the existing gap in the UK literature by examining the correlation between advertising and profitability across a range UK firms. The second aims at avoiding the problem of distinguishing causation, by focusing on a possible role for advertising in affecting the likelihood that a firm will go into receivership.

The rest of the paper proceeds as follows. In section 2, the data set is introduced, and the initial model to be estimated is specified. Sections 3 and 4 report and discuss the two approaches to investigating the effect of advertising on firm performance. Some concluding remarks are made in section 5.

2. Empirical model

Approaches to investigating profitability based on cross-sectional data have been the subject of considerable criticism (see, for example, Bresnahan, 1989). Specifically, explanatory variables (such as advertising) are likely to be endogenous to the model with possible impacts on the efficiency and unbiasedness of OLS estimators. Furthermore, the existence of non-observable factors which are correlated with independent variables may also have an adverse impact on estimates. For example, if there is a positive link between advertising and product quality, then an observed correlation between advertising and profitability might be caused by an unobservable correlation between advertising and product quality. As a result of this debate, the use of cross-sectional models has declined somewhat in favour of firm panel data. Panel data allows an appeal to recursivity to get around the problem of endogeneity, whilst the modelling of firm fixed effects can address the problem of unobservable variables.

The lack of UK firm level panel data on advertising make such an approach difficult in the present context. However, it is still possible to make a good case for the use of cross-sectional data. For example, Schmalensee (1989) argues that econometric results based on cross-section data can still provide valuable insights into firm and industry behaviour as long as not too much is claimed of the data. Thus, he calls for cross-section 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 paper is undertaken.[2]

Although the appropriate dependent specification for profitability is the subject of some debate, we use here the mark up of price over marginal cost or the price-cost margin. Under the assumption of long-run constant returns to scale, the price-cost margin is equivalent to:

$$pcm_i = \frac{\pi_i}{s_i} - \frac{(g + \delta).k_i}{s_i} \qquad (1)$$

where π_i = profits for firm i; s_i = value of sales for firm i; k = capital; g = competitive rate of return; δ = depreciation rate of capital (see Schmalensee, 1989, p.960).

The price-cost margin is zero under competitive conditions, when only a normal rate of return is being made. Returns above this level can be considered supernormal profits which are associated with various firm- and industry-level variables.

Thus, our general estimating equation is as

follows:

$$(\frac{\pi}{s})_i = a_0 + a_1.(\frac{k}{s})_i + A.z_i + B.w_j + u_i \qquad (2)$$

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.

3. Data

The lack of reliable data on advertising is notorious (see, for example, Rogers and Tokle, 1995). In the UK, the situation is exacerbated by the absence of any official data collected at the level of the firm.[3] In this paper, data on advertising intensity in 1992 are taken from a survey of the advertising managers of 325 medium size and large UK firms.[4] Clearly advertising may cover a variety of selling expenses. Further, whether a particular selling expense should be classified as advertising may vary in different situations. Consequently, the survey does not define the concept rigidly. Rather, managers are allowed to decide what expenditure they should include. Although this approach has its drawbacks, it does allow us to model the impact of the decisions of managers, as they perceive them, on firm performance. As in most empirical work on advertising, we also assume that the impact of advertising is correlated with expenditure.

Advertising patterns vary quite considerably across sectors and industries. Notably, mean advertising intensity for firms which produce mainly consumer goods is 2.58 per cent compared to 1.12 per cent for producer goods firms. On the other hand, the proportion of firms who do not advertise at all (just under 20 per cent) is fairly constant across consumer and producer goods sectors.

Data on turnover, profits and assets are obtained for each firm over the period 1991-1993 using the FAME and Microexstat databases.[5] Missing data for some of these variables reduces the sample size for the econometric work to 272.[6] Following work such as Machin and Van Reenan (1993) the measure of profits used is 'pre-tax operating profits', whilst our measure of capital is 'tangible fixed assets'. We allow for industry-specific factors both by including specific structural variables and also by including dummy variables for each two-digit industry. Further, as the normal rate of return and depreciation may vary across industries (Schmalensee, 1989), we also experiment with interaction terms between the industry dummies and capital intensity.

In the light of the concern about endogeneity outlined above, advertising is lagged by one year. Thus, the empirical specification attempts to examine how advertising affects future profitability of firms. As advertising is likely to be quite highly correlated over time, the endogeneity problem does not disappear and this issue is tackled in a novel way in Section 4 below. As a measure of advertising, both total advertising expenditure and the ratio of advertising to total sales have been used and justified in different contexts. For example, Cowling *et. al.* (1975) argue that it is the absolute numbers of advertising messages that cause barriers to entry. Consequently, total expenditure may be a better predictor of profitability than advertising intensity.[7] In this paper, we experiment with both measures.

A further issue is whether advertising should be treated as intangible capital rather than as a current expense. If advertising has significant impacts which last for more than one period, the former specification is

appropriate. Treating advertising as a current expense means that the firm's equity will be underestimated and the absolute value of profits overstated. In this case, the rate of return is likely to be overstated quite significantly for firms that have high levels of advertising. The results of studies which have adjusted for this bias are dependent on the rate of depreciation used. The results in this paper are extremely robust to treating advertising as capital as long as the annual depreciation rate of advertising is above 50 per cent. As most recent studies have found depreciation rates well in excess of this, we argue that this issue is not a significant problem here.[8]

4. Effect of advertising on profit margins

4.1 Basic model

Table 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 between advertising in 1992 and profitability across 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 is strongest with future profits. For advertising intensity, the correlation is at its strongest for current 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.

Thus, profitability seems to be more highly correlated with lagged rather than future advertising. Further, there seems to be some evidence that profitability is more strongly correlated with total expenditure 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, larger firms may be more likely to advertise. This is explored in more detail below.

Table 2 presents estimates of the determinants of profit margins using advertising intensity as an independent variable. Although, as discussed above, the problems arising from the possibility of advertising being endogenous are unlikely to be resolved, for completeness we report Hausman tests for exogeneity. This test is based on 2SLS results using lagged profit and an indicator variable for whether a firm produces psychologically sensitive goods as instruments.[9] In no case can we reject the null hypothesis that advertising is an exogenous variable.

Our empirical approach is to focus initially on the variable of interest (advertising) and then to test the robustness of any relationship to the inclusion of the other controlling factors. 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 per cent level. The coefficient on the interaction term between advertising and non-consumer firms is negative, but insignificant. It remains so in all specifications and is thus omitted from subsequent regressions. This finding, that the positive relationship between advertising

Table 1: Raw correlation between advertising in 1992 and profit rates in 1991-93

		1991	1992	1993
	A/S	-0.0846	0.0883	0.0481
		(0.15)	(0.14)	(0.43)
All firms	A	0.0216	0.0529	0.0898
		(0.71)	(0.37)	(0.13)
	N	293	285	277
	A/S	0.0134	0.1029	0.0921
		(0.89)	(0.27)	(0.34)
Consumer firms	A	0.1150	0.1513	0.1908
		(0.21)	(0.10)	(0.04)
	N	117	115	111

Note: figures in parentheses are significance levels

intensity and profitability is restricted to consumer goods industries, is consistent with previous work, for example, Domowitz et. al., (1986) and Megna and Mueller (1991).

Diagnostic tests suggest that the null hypotheses of homoscedastic and normal error terms should be rejected. Hence robust standard errors 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;[10] market share; industry import intensity; market growth from 1990-92. Inclusion of these variables restricts the sample to 242 firms. Only the market growth variable is significant at the 10 per cent 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 and the reduction in sample size, they are not included henceforward.[11]

In column 5, the two-digit industry dummy variables are included along with their interaction terms with capital intensity. Not surprisingly, the explanatory power of the model increases greatly. However, the coefficient on the advertising variable is barely altered. Thus, there is no evidence that the advertising effect is the result of industry specific factors.[12]

4.2 Long-run effects

In order to distinguish the long-run effects of advertising, Table 3 includes a lagged profit rate variable. Due to the presence of heteroscedasticity, robust standard errors are again reported. 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.[13] This result is unchanged when the coefficient on the capital

Table 2: Estimates of determinants of profit rates

	(1)	(2)	(3)	(4)	(5)
Assets/sales 93	.0268***	.0273***	.0273***	.0324***	1.412
	(.0072)	(.0071)	(.0090)	(.0128)	(1.435)
A/S	.5081				
	(.3371)				
A/S* Consumer		.9601**	.9660**	.9346**	.9118***
		(.4255)	(.4199)	(.4342)	(.3830)
A/S* Non consumer		-0.0434			
		(.4631)			
Log(assets)				.1178	
				(.5147)	
Industry share				-0.0099	
				(.0176)	
Import intensity				.0168	
				(.0217)	
Ind. growth 90-92				.1076**	
				(.0498)	
Industry dummies	No	No	No	No	Yes
Constant	No	No	No	No	Yes
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
Hausman test	2.08	6.47	0.96	0.05	-
Heteroscedasticity	10.94***	8.14***	-	-	-
Functional form	13.99***	13.3***	-	-	-
Non-normality	3.34***	3.26***	-	-	-

Notes: 1. Dependent variable is (pre-tax profit/sales) in 1993. 2. Figures in brackets (1) and (2) are standard errors. Figures in (3)-(5) are standard errors robust to heteroscedasticity and non-normality. 3. * indicates significance at 10% level, ** at 5%, *** at 1%. 4. The Hausman test is based on 2SLS estimates using lagged profit rate and an indicator variable for firms producing psychologically sensitive goods as instruments. Introduction of industry dummies and interaction terms (col.5) render the test inoperable. 5. 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 for heteroscedasticity is the Cook-Weisberg test described in Goldstein (1992). The test for non-normality is the Shapiro-Wilk test of both skewness and kurtosis.

Table 3: Determinants of profit rates: long-run effects

	(1)	(2)
Asset/sales 93	0.0131*	0.2346
	(0.0076)	(1.092)
A/S* Consumer	0.4427	.1866
	(0.2815)	(.2689)
Profit rate 92	0.7261***	0.7374***
	(0.0854)	(0.0794)
Industry dummies	No	Yes
Industry* asset sales	No	Yes
Constant	1.149	42.75
	(0.8340)	(43.93)
N	272	272
Adj. R^2	0.4883	0.6193

Notes: 1. Figures in parentheses are standard errors robust to heteroscedasticity and non-normality. 2. For other notes, see table 2.

intensity variable is allowed to vary across industries (column 2).

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 3, column 1) is considerably larger than the short-run effect of 0.966 (from Table 2, column 3). When the industry dummy variables are included (Table 3, column 2) the long-run effect goes down to 0.711 whereas the short-run effect is 0.912 (Table 2, column 5).

Given the insignificance of the advertising variable in the long run, these results are 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 suggests that advertising plays a part in this persistence of profits. Thus, once lagged profits are included, the effect of current advertising is 'washed out'.

4.3 Total advertising

Table 4 reports estimates including both advertising intensity and total advertising expenditure (in millions). The advertising effects are again restricted to the consumer firms and robust standard errors reported. The total advertising coefficient is strongly significant and much more so than that on advertising intensity. As discussed earlier, the positive correlation between total advertising and profits may be caused by the influence of firm size. This is controlled for by including log of assets as an independent variable.

Table 4: Determinants of profit rates: advertising intensity versus total advertising

	(1)	(2)	(3)
Asset/sales 93	0.0254***	1.412	0.0131*
	(0.0090)	(1.435)	(0.0076)
A/S * consumer	0.7685	0.6044	0.0226
	(0.4671)	(0.3740)	(0.2831)
A * consumer	0.0931***	0.1040***	0.0565**
	(0.0313)	(0.032)	(0.0225)
Log(assets)	0.3518		
	(.4330)		
Profit rate 92			0.7345***
			(0.0795)
Industry dummies	No	Yes	Yes
Industry * ass/sales	No	Yes	Yes
Constant	2.665***	-107.00	43.01
	(0.8997)	(57.05)	(43.97)
N	272	272	272
Adj. R^2	0.0605	0.1665	0.6194

Notes: see table 3

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 inclusion of industry dummies (column 2) again has little effect on the results.

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.[14] 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, we can see that 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 3), but remains significant, unlike that on advertising intensity.

In sum, advertising seems to be a significant determinant of the profit margin of firms in consumer industries, a result that is robust to a variety of specifications.

5. Advertising and firm exit

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

The measure suggested here is firm failure. If there is a causal link running from advertising to profitability, then firms which 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 firm performance and there is no direct link from exit (in period t) to advertising (in period t-1 or earlier). 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 from the industry 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 may be associated with low advertising, but causation would be going from profitability to advertising. However, it is possible to allow for this eventuality by controlling for lagged profitability and, 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 producer level, there has been little scope to examine whether any such link exists. The only US study 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 have a weak, positive impact on firm exit. Kamshad (1994) uses probit estimators to examine the probability of exit across French firms, focusing on ownership structure. A similar approach is applied here, but the probabilities are allowed to vary with advertising.

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

$$y^*_i B'z_i + u_i \qquad (3)$$

The observed variable is y:

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

The observed variable is constructed as follows:

$y = 1$ if firm i went into receivership during the two years following the survey in May 1992

$y = 0$ otherwise.

Out of 324 firms for which data are available, 19 (5.9 per cent) 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 that were included in the survey and that could be traced, 44 (4.5 per cent) 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 per cent level of significance (z-statistic = 0.898).[15]

5.2 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

Table 5: Raw correlations between firm exit and advertising

	All firms	Consumer firms
A/S	-0.0569	-0.1404
	(0.32)	(0.12)
N	301	121
Advertising dummy	-0.0881	-0.2816
	(0.11)	(0.00)
N	324	131

Note: Figures in parentheses are significance levels.

Table 6: Probit estimates of firm exit - I

	(1)	(2)	(3)	(4)
Log(age)	-0.2502			
	(.6010)			
$[Log(age)]^2$	.0299			
	(.1023)			
Log(age) * consumer		.7657**	.8341***	.7651***
		(.3091)	(.3204)	(.3133)
$[Log(age)]^2$ * consumer		-0.2048**	-0.2160**	-0.2048**
		(.0821)	(.0848)	(.0835)
Log(assets)	-0.1390	-0.1536***	-0.1395**	-0.1503***
	(.0554)	(.0576)	(.0631)	(.0582)
A/S			-0.0983	
			(.0711)	
Advertiser				-0.3275
				(.2576)
Constant	-0.7709	-1.267***	-1.211***	-1.039***
	(.8450)	(.1887)	(.2184)	(.2566)
Mean of dep. variable	0.059	0.059	0.060	0.059
N	324	324	301	324
Log likelihood	-68.63	-65.52	-61.66	-64.74
Pseudo R^2	0.0511	0.0940	0.0953	0.1049
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, as described in the data appendix. 2. Figures in brackets are standard errors. 3. * indicates significance at 10% level, ** at 5%, *** at 1%. 4. The diagnostic tests are adapted from those described in Machin and Stewart (1990) for the ordered probit model.

into receivership than relatively new entrants. The relationship is unlikely to be linear. Rather, the probability of exit is likely to decrease with age in the early years of the firm's existence. Once firms are established, however, there should be no correlation. Following both Dunne and Hughes (1994) and Kamshad (1994), the log of age is employed, 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.[16] 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. First is the profit rate in 1991. Low profitability may signal that a firm is at particular risk of subsequently going into receivership. The same argument applies to the second 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 which states that they reduced advertising since 1985. If such firms are 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.

5.3 Empirical results

Table 5 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 6 and 7. In columns 1 and 2 of Table 6, 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 quadratic age term is negative. In other words, age increases the probability of going into receivership, but only for younger firms.

Both the advertising variables are experimented with: advertising as a percentage of sales (in column 3) and the dummy for advertisers (in column 4). Both attract the expected, positive coefficient, but neither is significant at conventional levels.

In Table 7, column 1, the advertising dummy variable effect is restricted to consumer firms. The coefficient is now significant at the 5 per cent 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 in absolute terms and is now significant at the 1 per cent level. For consumer firms at least, advertising seems to decrease the probability of going into receivership. Thus, in column 3 of Table 7,

Table 7: Probit estimates of firm exit - II

	(1)	(2)	(3)	(4)	
Log(age)*consumer	1.219***	-0.4475**	-0.4475***	-0.6543***	-0.6721***
	(.4201)	(.1785)	(.1628)	(.2095)	(.2151
[Log(age)]^2*consumer	-0.2831***				
	(.1000)				
Log(assets)	-0.1396**	-0.1557***	-0.1557***	-0.0835	-0.0705
	(.0590)	(.0660)	(.0555)	(.0619)	(.0667)
Advertiser*consumer	-0.8527**	-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 92				-0.0263***	-0.0263***
				(.0059)	(.0083)
% change profit 89-91					-0.0045***
					(.0017)
Decrease adv. 85-92					.1249
					(.3761)
Constant	-1.309***	-1.279***	-1.279***	-1.638***	-1.689***
	(.3219)	(1.907)	(.1741)	(.1899)	(.1901)
Mean of 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 R^2	0.1270	0.1431	0.1431	0.3168	0.4591
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 robust to heteroscedasticity and non-normality. 2. For other notes see table 6.

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 are more likely 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 attracts the expected negative coefficient.[17] The dummy for firms which reduced advertising in the five years prior to the survey attracts a

Table 8: Increases in probability of exit

	column 3	column 4	column 5
Log(age) * consumer	-3.63	-3.28	-1.30
Log(assets)	-1.26	-0.419	-0.290
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 in profit rate 90-92			-0.069
Decrease in advertising 87-92[d]			0.52

Notes: Probabilities are estimated from table 7, cols. 3-5. 2. For continuous variables, figures represent rates of change of probabilities. 3. For dummy variables (indicated by [d]), figures represent the increases in probability for cases where the variable = 1, over cases where the variable = 0.

positive coefficient that is not significantly greater than zero.

The coefficients from Table 7, columns 3 - 5 are converted into probability effects in Table 8. These suggest that, when the lagged profitability controls are not included, consumer firms which advertise are estimated to be about 7.5 per cent less likely to go into receivership than those which do not advertise. When profitability is controlled for, the estimated decrease in probability is closer to 6 per cent.

Despite the relatively small sample size, these results suggest that whether a firm advertises or not exercises a causative effect on firm performance. The scope for simultaneity bias is lower with this approach than with more traditional advertising-profitability studies, but, in any case, the findings are robust to controls for reverse causality.

6. Conclusions

This paper has investigated the links between advertising and firm performance using a unique dataset of UK firms. Many econometric problems beset the investigation of this relationship, particularly in the context of cross-sectional data. Most notable are issues of causality and the existence of unobservable explanatory variables. Thus, the methodology adopted in this paper has been to attempt to draw robust generalisations from the data. Four such generalisations can be drawn from the evidence presented in this paper:

- Advertising is correlated with firm level profitability for firms which act mainly in consumer goods industries.
- The correlation is stronger when total advertising expenditure rather than advertising intensity is used, even when firm size is controlled for.
- The correlation with future profitability is higher than that with lagged profitability.
- Firms which do not advertise seem less likely to go into receivership than those which do advertise.

In the absence of convincing instruments, it is difficult to reject conclusively the possibility that

causation may be going from firm performance to advertising. However, there is support for the reverse causation given 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 running from total expenditure to profits than from advertising intensity to profits.

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.

The evidence presented in this paper is consistent with a view that some advertising (particularly that in consumer industries) has an impact on firm performance. It is, however, difficult to envisage further light being shed on the debate unless the accessibility of firm level data on advertising in the UK is improved. Given the severe limit on the availability of official data, further attempts at collecting data from surveys of firms, perhaps coupled with more detailed case studies, may offer the most fruitful way forward.

Data Appendix

Survey variables

Advertiser: is a dummy variable constructed as = 1 if the firm indicated that it advertised; = 0 otherwise. Firms that 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 (A): is total advertising in millions estimated as A/S multiplied by 1992 firm sales. Where possible, 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 the firm for 1991 was used in preference to the calculated one.

Advertising Intensity (A/S): the percentage of sales spent on advertising. 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 per cent are counted as having an advertising intensity of 0.25 per cent.

Consumer: is a dummy variable constructed as = 1 if the firm produces mainly for final consumers; = 0 otherwise.

Decrease Adv: is a dummy variable equal to 1 if the firm indicated that it had decreased advertising since 1985; = 0 otherwise.

Firm Variables

Age: age of the firm in years at 1992. Taken from the FAME database.

Assets: is Net Fixed Tangible Assets. Taken from the Microexstat and FAME databases.

Assets/Sales: is Assets divided by Sales. Taken from the Microexstat and FAME databases.

Change in Profits 1989-1991: is calculated as 100*(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.

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.

Profit Rate 1993/1992/1991: are the price-cost margins for each firm in 1993, 1992 and 1991 respectively. These are calculated as (pre-tax profit/sales), which is equivalent to the price-cost markup assuming constant returns to scale. The source is the Microexstat database.

Industry Variables

Firms are allocated an SIC three-digit industry

according to their primary area of activity from the Microexstat database. Where more than one three-digit industry is 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.

Import Intensity: percentage of industry sales which are imported. Calculated as (Industry Imports) divided by 100*(industry sales + industry imports - industry exports). The source is *Business Monitor* MQ10, HMSO.

Industry Dummies: are based on the SIC 2 digit classification of the firm's primary area of activity.

Industry Growth 90-92: Percentage growth in industry sales from 1990 to 1992 using 1989 as the base year.

Industry Share: calculated as Firm Sales divided by Industry Sales. Industry sales are at the three digit industry level and are taken from *Census of Production* Summary Volume, PA1002, HMSO.

Endnotes

1. The Nottingham Trent University. The authors would like to thank John Cable, Jonathan Haskell, Stephen Machin, John van Reenan and two anonymous referees for helpful comments.

2. A further defence of the use of cross-section data in the context of firm profitability models is given in Kardasz and Stollery (1995).

3. MEAL publish some advertising data by firm but this is aggregated up from the product level. This source is used to formulate advertising time series in a recent paper by Abbott *et al* (1997).

4. Further details of the survey can be found in Paton (1998, 1997).

5. FAME (Financial Analysis Made Easy) is a database of accounts of over 130,000 major public and private British companies produced by Jordans. Microexstat is a database of accounts of about 3,000 UK companies, produced by EXTEL Financial Limited.

6. See Paton (1997) for a more detailed discussion of the non-respondents and for formal tests which show that the sample is representative.

7. An exception to this is where firms are able to identify, and target directly, potential customers.

8. These results can be found in Paton (1997). See Hirschey and Wegandt (1985) for an example of the extensive literature in this area.

9. Specifically these goods are pharmaceuticals, cosmetics and toys (see Buxton, Davies and Lyons, 1984).

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

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

12. One specific issue is that if intensive advertisers are in concentrated industries, those firms might show higher profitability as a result of being sheltered from competition rather than due to advertising. In fact, for the manufacturing firms, the correlation coefficient between advertising intensity and the five-firm concentration ratio, although positive, is quite low at 0.0872 (significance level = 0.24).

13. Diagnostic tests suggest that there may be a problem with functional form in this specification. Inclusion of a quadratic advertising term improves the fit of the model marginally, but the coefficient on this as well as that on the linear term are insignificant at the five per cent level.

14. 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.

15. A referee makes the further point that certain sectors may be more vulnerable to failure than others. The small number of firms in receivership precludes us from using industry dummies to allow for this. However, the fact that industry specific factors had no effect on the advertising coefficients in the profitability regressions above suggests that this may not be a serious problem here. In any case, this is an issue which future work might usefully pursue.

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

17. In a further experiment, the percentage change in profits between 1990 and 1992 was included as an independent variable. Although this had slightly more explanatory power than the 1989-91 variable, it resulted in the loss of 7 more observations due to missing data. In any case, the advertising coefficient remained negative and highly significant.

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