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Role of advertising in oligopolistic markets: theory and evidence

M M. Metwally
University of Wollongong

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M.M. Metwally

Department of Economics
The University of Wollongong
Wollongong NSW 2500 Australia

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Co-ordinated by Dr Charles Harvie & Di Kelly
PO Box 1144 [Northfields Avenue], Wollongong NSW 2500 Australia
Phone: [042] 213 666 or 213 555. Fax [042] 213 725

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ABSTRACT

This paper offers a theoretical discussion of a number of criteria that may be used in distinguishing the role of advertising in an oligopolistic market framework. Empirical evidence is obtained by testing single and simultaneous equation models using Australian data related to the banking industry.

INTRODUCTION

It may be possible, at least theoretically, to distinguish between three types of advertising, according to the objective and outcome of the campaign: informative, offensive and defensive advertising. Informative advertising is a form of consumer education which is necessary if consumers are to make intelligent choices, in fact it makes competition nearly perfect since one of the basic assumptions of perfect competition is perfect knowledge. Since in real life imperfect knowledge is the rule rather than the exception, advertising plays a major role in our economy. The main tasks of a seller are to inform potential buyers of his existence, his line of goods and his prices. Since both buyers and sellers change over time (due to birth, death, change in age and migration), since people forget information once acquired, and since new products (and new uses of existing products) appear, the existence of sellers must be continuously publicised [2].

Many oligopolistic markets are characterised by non-price competition. In such markets, advertising is the main competitive mechanism. The producer who is deciding whether to advertise is therefore making a decision of fundamentally the same kind as that which he makes when he decides what price to charge for his product or how large an output to produce. It is not really very important to him whether his firm maximises its profit by changing the price - output of its products, by altering the physical constitution of its products; or by spending money on advertising. The primary objective of competitive advertising is for the firm to make its potential customers look upon its product as rather different from the other product. The idea is to use advertising in lowering the elasticity of demand for the brand in question. When this happens, the consumers will regard this brand as being more desirable, even if its price is rather higher than the prices of close substitutes. This would increase sales and, possibly expand the brand's market share.

Advertising is often used as a defensive mechanism to protect existing market shares. This often happens when new firms find it easy to enter the market. It has been noted that when any firm embarks on an intensified advertising campaign, other firms step up their promotional expenses to avoid a possible loss of market position. On the other hand, if any firm decides to economise on its advertising budget without a compensating increase in some

other aspects of its total selling effort, its exposure is reduced and its share of the market may decline if its competitors do not follow a similar policy. Competitive pressures may lead individual firms to increase their advertising expenditure and the same pressure would also preclude their decreasing it.

The aim of this study is to examine the role of advertising in oligopolistic markets. The paper is divided into four sections. Section one offers a theoretical discussion of the criteria that may be used to assess the role of advertising and the models which will be tested to provide empirical evidence. Section two outlines the basic characteristics of the data used in the analysis and reports the regression results of single equation models. Section three tests a simultaneous equation model to examine the interdependence between market shares and advertising within an oligopolistic market structure. Finally section four summarises the main findings of the paper. Although the empirical evidence is related to the Australian banking industry, the methodology and conclusions should be relevant to most oligopolistic markets characterised by non-price competition.

SECTION 1
THEORY AND MODELS:

Let us assume that there are two competing firms: A and B, where,

V_A = Firm A's advertising

V_B = Firm B's advertising

M_A = The market share of Firm A

M_B = The market share of Firm B

In the absence of price competition, an assumption which is not too unrealistic in many oligopolistic situations, we have:

$$M_A = \phi (V_A, V_B) \quad (1)$$

$$M_B = \psi (V_A, V_B) \quad (2)$$

$$V_A = f (V_B) \quad (3)$$

and, $$V_B = g (V_A) \quad (4)$$

Equations (1) and (2) show that the market share of each firm is a function of the firm's own advertising as well as its competitor's advertising with the following properties:

$$\frac{\partial M_A}{\partial V_A} > 0; \quad \frac{\partial^2 M_A}{\partial V_A^2} < 0; \quad \frac{\partial M_B}{\partial V_B} > 0; \quad \frac{\partial^2 M_B}{\partial V_B^2} < 0; \quad \frac{\partial M_A}{\partial V_B} < 0; \quad \frac{\partial M_B}{\partial V_A} < 0.$$

These properties suggest that market share is positively related to the firm's own advertising with diminishing returns and negatively related to the competitor's advertising.

Equations (3) and (4) represent advertising reaction functions where the firm's own advertising depends on the competitor's advertising in the frame of an oligopolistic interdependence.

If the firm's objective is to maintain its market share and use advertising as a tool to achieve this objective, we have:

$$\in_A / \sigma_A = \zeta. \quad (5)$$

Equation (5) suggests that in the absence of price competition a firm will reach optimality with respect to its advertising expenditure when the ratio of its market-share elasticity with respect to its own advertising $[\in_A = (\partial M_A / \partial V_A) (V_A / M_A)]$ to its market share elasticity with respect to competitors' advertising $[\sigma_A = (\partial M_A / \partial V_B) (V_B / M_A)]$ and equals the advertising reaction elasticity $[\zeta_A = (dV_B / dV_A) (V_A / V_B)]$.

Also, if advertising was purely defensive we would expect an immediate and equal reaction i.e.

$$\partial M_A / \partial V_A \simeq - \partial M_A / \partial V_B \quad (6)$$

and this will give:

$$\epsilon_A/\epsilon_B = \theta_A/\theta_B \qquad (7)$$

where θ_A (= V_A / S_A) and θ_B (= V_B / S_B) are the advertising sales ratios of firms A and B respectively.

Equation (7) suggests that if advertising was used as a pure defensive mechanism the sales ratios of any two firms would be proportional to their market share elasticity with respect to their own advertising.

Movements in market shares of individual firms depend on many variables in addition to price and advertising competition. However, advertising is regarded as the major influence on market shares in mainly differential product markets characterised by non-price competition. But the exact relationship between advertising and market shares has not been fully understood in existing literature. A linear (or linearly transformed) relationship between the two variables implies no decreasing marginal returns to advertising. Its optimisation, therefore, would suggest infinite advertising followed by an infinite expansion in market share. This does not seem to confirm to the practical situation. Many oligopolistic industries are characterised by the existence of a high proportion of "attached" or "loyal" customers. This customers "loyalty" has serious implications for the advertising market-share relationship. First it suggests the existence of a saturation point. There is an upper limit to the percentage of market share a particular firm would be able to achieve through intensive advertising even if its competitors did not follow suit. Secondly, a firm is not likely to loose all or most of its market share simply because it does not retaliate immediately and equally. There will always be a number of "attached customers" who would not be easily persuaded to shift to other brands. This seems to be the case in most service industries. Banking is a good example. Many of the customers have been dealing with the same bank for generations. Also there seems to be an advantage not to change banks frequently since most, if not all, banks would seem to give preferential treatment (in granting various of loans and other services) to customers who held accounts with them for a minimum period of time. The following mathematical model has been developed to

capture the above-mentioned characteristics of advertising competition in differential product markets with non-price competition.

$$M_i = A + F \exp - (\alpha / V_i + \beta V_j)$$
$$A, F, \alpha, \beta > 0 \qquad (8)$$

where:
- M_i = market share of the ith firm.
- V_i = advertising outlays of the ith firm.
- V_j = rival advertising in period t.
- A = percentage of total industry's customers (or sales) loyal to the ith firm.
- F = percentage of total industry's customer (or sales) not attatched to any firm.

The above model gives:

$$\frac{\partial M_i}{\partial V_i} = F (\alpha / V_i^2) \exp - (\alpha / V_i + \beta V_j) > 0 \qquad (9)$$

$$\frac{\partial M_i}{\partial V_j} = - \beta F \exp - (\alpha / V_i + \beta V_j) < 0 \qquad (10)$$

$$\lim_{V_i \to \infty} M_i \Big| V_j = 0 = A + F \qquad (11)$$

$$\lim_{V_i \to 0} M_i \Big| V_j > 0 = A \qquad (12)$$

$$\lim_{V_j \to \infty} M_i \Big| V_i = 0 = A \qquad (13)$$

The relationship expressed by equations (9) through (13) have the properties of the log normal distribution [1]. These relationships clearly suggest decreasing marginal returns to expenditure on advertising. A firm would only be able to attract *a maximum* number of customers i.e. the "floating customers", even if it expands its advertising budget by extremely large amounts and its competitors did not follow suit. Also, a firm would *not* lose all its customers if it did not respond at all to rival advertising or if its competitors embark on massive advertising campaigns.

Empirical evidence on the role of advertising in oligopolistic markets was obtained by testing two econometric models:

$$\textit{Model 1}: \quad \ln M_{it} = a_o + a_1 \ln V_{it} + a_2 \ln V'_{jt} + a_3 \ln \bar{P}_t + a_4 \ln M_{it-1} + u_{1t} \tag{14}$$

$$\textit{Model 2}: \quad M_{it} = \alpha_o + \alpha_1 \exp - (\alpha_2 / V_i + \alpha_3 V'_j) + u_{2t} \tag{15}$$

Both models explore the existing relation between the share of the market and the share in marketing pressure. They give market share as a function of the firm's advertising (V_i) and competitive advertising of *all* other rivals (V'_j). Market share in Model 1 is also assumed to depend on relative prices ($\bar{P}$), while Model 2 assumes non-price competition. Model 1 is similar to the models developed by Kotler [16], Lambin [17], Urban [30] and Weiss [32]. The use of double-logs gives direct estimates of market share elasticities with respect to firm's advertising (a_1), rival advertising (a_2) and relative prices (a_3). The introduction of the variable M_{it-1}, gives the model a dynamic character. Model 2, is a non-linear relationship representing equation (8) which was developed in the light of the above theoretical discussion.

Model (1) was estimated using the least-squares method of estimation. The estimation procedure was carried out in three stages. In the first stage, parameters of the model were estimated consistently by Liviatan's instrumental variable approach. In the second stage, results of the first stage were employed in order to produce consistent estimates of the residuals by ordinary least squares. Finally using the results of the preceding stage, ordinary least squares was again applied to the transformed regression model to yield estimates of the parameter. The resulting estimates are consistent and asymptotically efficient.

The parameter estimates of *Model (2)* are maximum likelihood estimates obtained by the non-linear least squares, implying the usual assumptions about an additive error term.

In order to estimate the advertising reaction elasticities, we also tested the following econometric model:

Model 3: $$V_{jt} = b_0 + b_1 V_{it} + b_2 V_{jt-1} + e_t \qquad (16)$$

This reduced form is based on the following partial adjustment model:

$$V^*_{jt} = \beta_0 + \beta_1 V_{it} + u_t$$

$$(V_{jt} - V_{jt-1}) = \delta(V^*_{jt} - V_{jt-1}) + \in_t \ , \qquad 0 < \delta \leq 1.$$

A substitution yields

$$V_{jt} = \delta\beta_0 + \delta\beta_1 V_{it} + (1 - \delta) V_{jt-1} + (u_t + \delta \in_t)$$

which is the same as (16) above.

Model 3 was estimated using the same techniques as used for *Model (1)*.

SECTION 2
DATA AND REGRESSION RESULTS

Models 1 and 2 were tested using data related to four Australian banks. Data on advertising were provided by Garnsey Pty Ltd, Marketing and Advertising Consultants, Sydney. Data on interest rates, loans and bank revenues were supplied by individual banks. The most recent figures were checked for accuracy by comparing them with those published in the special issues of the *Australian Business Review Weekly*, Oct. 1988, 1989 and 1990. The most basic characteristics of these banks are shown in Table 1. These banks went through extensive deregulation arrangements in the early 1980's. Interest rate controls on deposit rates

were removed in December 1980 and regulations on the terms of fixed deposits and certificates of deposits were relaxed in August 1981, March 1982, and abolished in August 1984. Interest rate regulations on loans were relaxed in April 1985 and April 1986. Portfolio restrictions were relaxed sequentially in June 1982 (the end of quantitative lending guidelines), August 1982 (to savings banks), and relaxation of asset compositions in May 1985, April 1987 (to savings banks) and September 1988 [9]. Another important structural change in the Australian banking industry was the entry of foreign banks in 1985 in reply to the Treasurer's invitation [3]. It was predicted that these banks would secure 20% of the Australian banking market within five years of their entry [12]. As a result of deregulation banks have had to achieve substantial improvements in operating costs and in their marketing behaviour to maintain adequate profitability. They paid attention to both price and non-price attributes of their products. The new entrants to the market have shown the ability to win market share and have affected competition in product innovation, pricing access and delivery. The emphasis on non-price competition manifests itself in the incentives of banks to differentiate themselves and their products. There has been a dramatic increase in marketing research and a tendency to rely more on competitive advertising in expanding market shares and to use advertising as a defensive mechanism to maintain existing market shares of some banks.

We labelled our sample, Bank A, B, C and D in order not to disclose confidential information about their operations. Banks A and B are established financial institutions with estimated total assets of more than 36 billion US dollars each. Bank C's assets are valued at approximately 9 billion US dollars. Bank D is the smallest, in the sample, with estimated assets of approximately 4 billion US dollars. Table 1 reveals that there is a direct relationship between market shares and the size of assets. Profitability of the two large banks (as a percentage of their total revenue) is higher than that of the smaller banks. However Bank D, the smallest in the sample, seems to perform much better than Bank C. Also, this bank has the highest percentage of total revenue to total assets amongst all sample banks.

Table 1 Some Basic Economic Indicators of Sample Banks (1990)

Economic Indicators	Bank A	Bank B	Bank C	Bank D
Market Share (%)	13.2	12.4	2.6	1.8
Percentage of net profit to total revenue	6.4	4.1	2.4	3.6
Percentage of net profit to total assets	0.78	0.49	0.28	0.49
Percentage of total revenue on total assets	12.1	12.0	11.8	13.6
Average return on funds (%) (1987 - 1990)	12.0	9.0	5.1	7.9
Average return on revenue (%) (1987 - 1990)	6.3	4.1	2.5	3.7
Gearing	6.4	5.5	5.7	6.3
Average percent growth in revenue (1987 - 1990)	19.3	10.1	10.5	31.4
Average percent growth in profit (1987 - 1990)	35.0	2.8	17.8	24.7

The two large banks also seem to have a higher return on funds and revenue than the two smaller banks. But here again, Bank C's performance is inferior to that of Bank D. In terms of growth, the smallest bank scored the highest rate of growth in revenue and the second highest in profit during the three years 1987-1990. Bank B, the second largest in terms of assets and market share, scored the lowest rates of growth in these variables during the mentioned period. Gearing, which is defined as shareholder's funds as a percentage of total assets, does not seem to differ much between larger and smaller banks included in the sample.

The three econometric models specified above were tested on annual data for the period 1975-1989. The regression results are given in Tables 2, 3 and 4 respectively. It is clear that all variables carry the correct sign. The values of $\bar{R}^2$ suggest a good fit in each case and the

values of D.W. or Durbin's h (in case of the lagged models) do not suggest the presence of any serious problems of serial correlation.

The t values (given in parenthesis under each coefficient) for the price variables (which are represented by relative interest rates ($\bar{r}_{it}$)) were not statistically significant in most cases. This suggests that during the period of study, most of it was subject to financial regulations, non-price competition was a main feature of Australian banks. It seems, therefore that advertising has succeeded, in this industry, to minimise direct comparison of interest rates.

The regression results suggest that bank's own advertising and competitive advertising are both significant determinants of the competitive position of banks as given by their market shares. This is evident from the statistical significance of the coefficients of V_i and V_j in both *Models (1) and (2)*. On the whole one observes that *Model (2)* gives superior results to *Model (1)* as indicated by the values of $\bar{R}^2$. Also, the error variance $S^2 = \Sigma[X - E(X)]^2$ where $E(X)$ is the expected value of X obtained from each regression was much smaller for *Model (2)* than for model (1). This would seem to support the hypothesis that the markets share-advertising relationship is *non-linear with a saturation point.*

Table 2 Regression Results of *Model (1)*

The Model: $\ln M_{it} = a_o + a_1 \ln V_{it} + a_2 \ln Vj'_t + a_3 \ln \bar{P}_t + a_4 \ln M_{it-1} + u_{1t}$

Estimated Coefficients	Bank A	Bank B	Bank C	Bank D
$\hat{a}_o$	.435 (1.429)	.471 (2.022)	.523 (3.017)	.560 (2.954)
$\hat{a}_1$	.036 (2.816)	.038 (2.798)	.044 (2.794)	.045 (2.840)
$\hat{a}_2$	-.034 (-2.949)	-.037 (-2.740)	-.038 (-2.925)	-.036 (-2.789)
$\hat{a}_3$	-1.144 (-1.835)	-1.210 (-1.777)	-1.319 (-1.804)	-1.346 (-1.980)
$\hat{a}_4$	.684 (2.976)	.673 (2.888)	.809 (2.871)	.792 (2.885)
$\bar{R}^2$	.874	.819	.822	.867
F	19.6	17.7	23.4	21.5
Durbin's "h"	.310	.244	.365	.272

The results of *Models (2) and (3)* were used to estimate marginal rates of change of market shares with respect to bank's advertising ($\partial m_i / \partial V_i$) and competitors' advertising ($\partial m_i / \partial V_j$), market share elasticities and advertising reaction elasticities. These estimates are given in Table 5. Also given in this table are actual advertising revenue ratios of the four banks, where bank's revenue is taken as a proxy variable for its sales.

The data in Table 5 would seem to suggest that:

(1) Larger banks use advertising as a defensive mechanism to protect their market shares. This is evident from:

(i) The approximate equivalence of the ratios of market share elasticities with respect to bank's advertising to the estimates of the advertising revenue ratios. It can easily be seen that for bank's A and B:

$$\in_A / \in_B \simeq \theta_A / \theta_B.$$

Table 3 **Regression Results of *Model (2)***

The Model: $M_{it} = \alpha_o + \alpha_1 \exp - \{\alpha_2 / V_i + \alpha_3 V_j\} + u_{2t}$

Estimated Coefficients	Bank A	Bank B	Bank C	Bank D
$\hat{\alpha}_o$	.069 (3.043)	.055 (2.906)	.012 (3.004)	.008 (2.985)
$\hat{\alpha}_1$	.461 (2.892	.456 (2.915)	.463 (3.017)	.459 (3.221)
$\hat{\alpha}_2$	.472 (3.516)	.637 (3.140)	.509 (2.946)	.523 (3.119)
$\hat{\alpha}_3$	.411 (3.220)	.584 (3.075)	.612 (2.989)	.645 (2.903)
$\bar{R}^2$	.934	.912	.905	.906
F	44.4	40.8	36.7	37.3
D.W.	1.849	2.003	1.946	2.141

Table 4 **Regression Results of *Model (3)***

The Model: $V_{jt} = b_o + b_1 V_{it} + b_2 V_{jt-1} + e_t$

Estimated Coefficients	Bank A	Bank B	Bank C	Bank D
$\hat{b}_o$	.723 (1.320)	.681 (1.971)	.708 (2.685)	.699 2.738)
$\hat{b}_1$	.521 (3.107)	.498 (3.500)	.204 (3.603)	.153 (3.000)
$\hat{b}_2$	.740 (3.025)	.671 (3.342)	.695 (3.526)	.623 (3.104)
$\bar{R}^2$	.907	.915	.922	.906
F	29.5	34.4	36.8	28.2
Durbin's "h"	-.142	.365	.244	-.150

Table 5 Market Shares' Response to Advertising

Variables	Bank A	Bank B	Bank C	Bank D
$\partial m_i / \partial V_i$	.113	.120	.154	.148
$\partial m_i / \partial V_j$	-.116	-.119	-.119	-.103
Market share elasticity with respect to bank's advertising (ϵ)	.036	.046	.055	.067
Market share elasticity with respect to competitors' advertising (σ)	-.034	-.044	-.042	-.045
Advertising reaction elasticity (ζ)	1.053	1.049	1.969	2.003
Advertising revenue ratios (θ)	.0014	.0018	.0085	.0108

(ii) The approximate equivalence of the ratios of market share elasticities with respect to banks and competitors' advertising to the value of advertising reaction elasticity i.e.,

$$-\epsilon_i / \sigma_i \simeq \zeta_{ij} \; ; \; i, j = A, B \; (i \neq j)$$

(iii) The estimates of the marginal rates of change of market share with respect to bank's advertising ($\partial m_i / \partial V_i$) and competitor's advertising ($\partial m_i / \partial V_j$) are very close. This suggests that a substantial part of advertising is self-cancelling.

(2) The data in Table 5, on the other hand, suggest that the advertising revenue ratios of banks C and D are much greater than the ratios of their market share elasticities with respect to bank's advertising or:

$$\theta_C / \theta_{nC} > \epsilon_C / \epsilon_{nC}$$

$$\theta_D / \theta_{nD} > \epsilon_D / \epsilon_{nD}$$

where nC refers to a bank other than C, and nD refers to a bank other than D.

Also, for banks C and D, the values of advertising reaction elasticity are much greater than the ratios of their market share elasticities with respect to bank's and competitors' advertising

$$\zeta_{ij} > - \epsilon_i / \theta_i \; ; \; i, j = C, D \; (i \neq j)$$

These results would seem to suggest that banks C and D advertise heavily. This excessiveness may suggest use of advertising as an offensive mechanism and not as a defensive tool.

SECTION 3
INTERDEPENDENCE BETWEEN MARKET SHARES AND ADVERTISING

There is a general agreement that not only market shares are influenced by advertising, but advertising is also influenced by market shares. Therefore, it could be argued that the analysis of the above section may be subject to a simultaneous bias. To overcome this problem, we tested a simultaneous equation model using the following structural equations:

$$M_{it} = \alpha_0 + \alpha_1 \exp - (\alpha_2 / V_{it} + \alpha_3 V'_{jt}) + \alpha_4 \bar{P}_t + \alpha_5 M_{it-1} + e_{1t}$$

$$V_{it} = \beta_0 + \beta_1 V'_{jt} + \beta_2 V_{it-1} + \exp (- \beta_3 / M_{it}) + e_{2t}$$

$$V'_{jt} = \gamma_0 + \gamma_1 V_{it} + \gamma_2 V'_{jt-1} + \exp [- \gamma_3 / (1 - M_{it})] + e_{3t}$$

where all variables are defined as before.

The above system has three endogenous variables: M_{it}, V_{it} and V_{jt} and five predetermined variables: $\bar{P}_t$, M_{it-1}, $(1 - M_{it})$, V_{it-1}, V_{jt-1}.

The first equation is similar to *Model 2* except that market share is assumed to depend also on relative prices (i.e. relative interest rates).

The *non-linearity* assumption is maintained to exhibit decreasing marginal returns to advertising expenditures and highlight the importance of consumers' loyalty.

The second and third equations in the system specify the advertising decision rule in terms of three factors usually deemed to influence the level of advertising appropriations i.e. market shares, firm's and rival advertising. Here again, we departed from existing literature by assuming a non-linear relationship between market share and advertising. This departure is based on two grounds. Established firms can use product differentiation (through advertising) as barriers to entry *only to a limited degree.* New entrants once passed the initial "break-in" period would be able to compete on equal terms with the old established firms. Secondly, firms do take account of possible rival responses in advertising. The negative effect of rivals' advertising on their demand will cause them to advertise less. Thus firms would try to avoid advertising-intensity wars as much as they would try to avoid price-cutting wars.

The introduction of lagged dependent variables in each equation gives it a dynamic character.

Applying the rank and order conditions of identification, we find that all equations are over- identified. The limited information maximum likelihood (LIML) is therefore, appropriate for estimating the parameters of the three equations. The regression results are given in table 6.

The regression results of the simultaneous-equations system would seem to support those of the single-equation models. The coefficients of the advertising variable in each equation were statistically significant and carry the correct sign. This indicates that advertising plays an important role in this market and that each firm tends to adjust its advertising according to the past appropriations of its rivals. Also, the regression results suggest that both firm's and rival advertising exert a significant influence on the competitive position of firms as given by their market share.

Table 6 Regression Results of Simultaneous Equation Models

BANK A

$$M_{it} = \underset{(3.005)}{.066} + \underset{(3.779)}{.473}\ \exp -\left(\underset{(3.412)}{.325} / V_{it} + \underset{(3.537)}{.468}V_{jt}\right) - \underset{(-1.989)}{.034}\bar{P}_t + \underset{(3.294)}{.420}M_{it-1}$$

$\bar{R}^2 = .923$; $F = 67.8$; $h = -.225$

$$V_{it} = \underset{(-.796)}{-.338} + \underset{(3.111)}{.802}V_{jt} + \exp\left(\underset{(-2.900)}{-.482} / M_{it}\right) + \underset{(3.251)}{.431}V_{it-1}$$

$\bar{R}^2 = .904$; $F = 31.2$; $h = .445$

$$V'_{jt} = \underset{(1.774)}{.327} + \underset{(2.999)}{1.218}V_{it} + \exp\left[\underset{(-3.355)}{-.343} / (1 - M_{it})\right] + \underset{(3.465)}{.220}V'_{jt}$$

$\bar{R}^2 = .914$; $F = 37.1$; $h = .645$

Table 6 Regression Results of Simultaneous Equation Models (cont.)

BANK B

$$M_{it} = .050 + .469 \exp - (.428 / V_{it} + .537V_{jt})$$
$$(2.965) \quad (3.188) \quad (3.241) \quad (3.002)$$
$$- .036\bar{r}_t + .362M_{it-1}$$
$$(- 2.006) \quad (3.499)$$

$\bar{R}^2 = .921$; $F = 49.3$; $h = 1.005$

$$V_{it} = -.213 + .913V_{jt} + \exp (-.485 / M_{it}) + .431V_{it-1}$$
$$(-1.611) \quad (3.008) \quad (-2.879) \quad (3.267)$$

$\bar{R}^2 = .898$; $F = 28.9$; $h = - .124$

$$V'_{jt} = .164 + .411V_{it} + \exp [- .317 / (1 - M_{it})] + .329V'_{jt}$$
$$(.925) \quad (3446) \quad (3.047) \quad (3.568)$$

$\bar{R}^2 = .948$; $F = 48.6$; $h = .107$

Table 6 Regression Results of Simultaneous Equation Models (cont.)

BANK C

$$M_{it} = .008 + .461 \exp -(.489 / V_{it} + .426V_{jt})$$
$$(3.011) \quad (3.205) \quad (3.398) \quad (3.267)$$
$$- .040\bar{r}_t + .522M_{it-1}$$
$$(- 1.904) \quad (2.963)$$

$$\bar{R}^2 = .909; \quad F = 31.1; \quad h = - .048$$

$$V_{it} = -.027 + .826V_{jt} + \exp(-.249 / M_{it}) + .416V_{it-1}$$
$$(-1.135) \quad (3.1421) \quad (-2.851) \quad (3.614)$$

$$\bar{R}^2 = .928; \quad F\ 41.1; \quad h = .446$$

$$V'_{jt} = .088 + .843V_{it} + \exp[- .132 / (1 - M_{it})] + .328V'_{jt}$$
$$(1.073) \quad (3.162) \quad (-3.600) \quad (3.941)$$

$$\bar{R}^2 = .931; \quad F = 42.6; \quad h = .597$$

Table 6 Regression Results of Simultaneous Equation Models (cont.)

BANK D

$$M_{it} = .066 + .473 \exp -(.555 / V_{it} + .500V_{jt})$$
$$(2.868) \quad (2.993) \quad (3.261) \quad (2.952)$$
$$- .041\bar{r}_t + .549M_{it-1}$$
$$(- 1.863) \quad (3.244)$$

$\bar{R}^2 = .918$; $F = 36.3$; $h = - .303$

$$V_{it} = -.077 + .868\, V_{jt} + \exp(-.262 / M_{it}) + .463V_{it-1}$$
$$(.691) \quad (3.100) \quad (-2.905) \quad (3.488)$$

$\bar{R}^2 = .926$; $F = 44.8$; $h = .674$

$$V'_{jt} = .122 + .324V_{it} + \exp[- .121 / (1 - M_{it})] + .382V'_{jt}$$
$$(-1.015) \quad (3.071) \quad (-3.408) \quad (2.956)$$

$\bar{R}^2 = .935$; $F = 39.2$; $h = 1.010$

The results of the simultaneous-equations model support the hypothesis that advertising and market shares are *non-linearly* related. This suggests decreasing marginal returns to expenditure on advertising in the banking industry. It also highlights the significance of "consumer loyalty" in analysis of the competitive behaviour of firms in certain markets. Moreover the coefficients representing the price variable were not statistically significant at the 5 percent level of significance in any of the firms studied. This suggests that the banking industry is characterized by non-price competition and indicates that advertising competition succeeded to minimise direct comparison of interest rates. This is not surprising given that interest rates on similar types of loans for equal periods do not seem to differ very significantly between banks.

The simultaneous regression results were used to test if the single-equation models' conclusions regarding the role of advertising in this industry still hold.

The regression results of Table 6 were used to estimate the market share elasticities of bank's advertising $\eta_{mvj} = [(\partial m_i / \partial s_j)(s_i / m_i)]$. These were: 0.038, 0.043, 0.052, 0.069 for banks A, B C and D respectively. Also estimated is the market share elasticity with respect to rival advertising $\eta_{mvj} = [(\partial m_i / \partial v_j) / (v_j / m_i)]$. The results were -0.034, -0.041, -0.040 and -0.047 for the banks A, B, C and D respectively. Finally, the results were used in estimating the reaction advertising elasticity $\eta_{v_i} = [(\partial v_i / \partial s_i) / (s_i / v_i)]$. These were 1.064, 1.057, 1.896 and 1.993. Comparing the values of these elasticities, we notice that for banks A and B, the values of the advertising reaction elasticity are very close to the ratios of their market-share elasticities with respect to their own and rival advertising. This suggests that advertising of those two (large) banks plays a "market defensive" role. As for banks C and D, the values of the advertising reaction elasticity are much greater than the ratios of their market-share elasticity with respect to rival and bank advertising. These results support the findings of the single-equation models and suggest that the smaller banks advertise heavily in trying to expand their market shares.

CONCLUSIONS

The main results of this paper may be summarised in the following:

(1) It is possible to investigate the role played by advertising and whether it is used as an offensive or defensive mechanism (in expanding or protecting market shares) through comparisons between values of elasticities with respect to a firm's own advertising, competitors' advertising and reaction advertising. This paper outlines a number of criteria which show how these comparisons can be used in evaluating this role.

(2) A saturation point seems to exist in the relationship between market share and advertising expenditure. This suggest that the variables are non-linearly related and their relationship may follow the properties of the log-normal distribution.

(3) The closeness of the estimates of the marginal rates of change of market shares with respect to firm's advertising and rivals' advertising suggest a substantial part of advertising is "self-cancelling".

(4) The statistical evidence suggest that the larger banks in Australia use their advertising expenditure in protecting their market position while the smaller banks advertise heavily in trying to expand their market shares and consolidate their positions.

(5) Advertising in the Australian banking industry, particularly during periods of financial regulations, has succeeded to minimise direct comparison of interest rates. This non-price competition has become a major feature of this industry.

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