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ADVERTISING, SUNK COSTS, AND BARRIERS TO ENTRY

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The representations and conclusions presented herein are those of the author and have not been adopted in whole or in part by the Federal Trade Commission or its Bureau of Economics. With respect to Line of Business data, only publicly available industry aggregates were utilized in this paper.

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I. Introduction

The present analysis is designed to test hypotheses about the entry-detering effects of advertising in the context of a simple model of entry behavior. Despite the considerable attention this question has received in the industrial organization literature, we note the lack of consensus and a continuing controversy. We attribute this, at least partly, to the absence of an underlying theoretical structure with sufficient empirical content. A formal selection among competing hypotheses requires such structure and this paper will attempt to provide it, albeit in a simplified form

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A contrary hypothesis was later proposed according to which advertising not only does not lead to monopoly power but actually promotes competition.⁵ This alternative model maintains that advertising, by providing information about the existence of alternative products and their price-quality characteristics, reduces the search costs faced by consumers, thereby decreasing their loyalty and inertia. Some support is provided for this view by the empirical finding that the prices for selected consumer products (e.g. eyeglasses) are lower in states where their advertising is permitted than where it is prohibited.

This paper attempts to clarify the mechanism through which advertising affects entry. We construct a model of entry behavior which isolates three separate effects of advertising: the effect on the measured rates of profit, the effect on the irreversible costs of entry, and the effect on the risk of entry as perceived by potential entrants.

A key point of our analysis is the high degree of sunkness characterizing investments in advertising. The need to sink money into advertising imposes an asymmetry between the incremental cost and incremental risk faced by a potential entrant and those faced by the incumbent firms.⁴ This asymmetry can be further exploited by the incumbents through strategic commitments in advertising to deter entry.

Of critical importance, too, is how the observed advertising intensity in a given market affects the entrant's perceived likelihood of successful penetration of that market. Thus, we present the main arguments put forth by the two major schools of thought concerning the relationship between advertising and competition and examine their implications for our somewhat narrower question of how advertising affects the risk of entry.⁷

II. The Model

The present analysis of the entry process is based on a set of strong assumptions. However, when compared to the more sophisticated analytic models available,⁸ it has the compensating advantages that: i) it is amenable to an operational specification, ii) it highlights the critical effect of sunk costs, which have been viewed recently as the principle barrier to entry,⁹ and iii) it permits the test of hypotheses concerning the threat of retaliatory responses by the incumbents as perceived by the potential entrant.

$$P = P_0 \left[1 - \frac{Q_e + \tilde{q}_e}{Q_0} \right]$$

where $p_0 = p(Q_0)$,

Q_e is the

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of the entry investment in capital and advertising respectively, in the event of exit.

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Under the assumption that entry into a given industry continues until the expected entry profit is driven to zero, we obtain the following expression for the number of new entrants:

$$n_e = \frac{g - \tilde{g}}{q_e/Q_0} + \frac{(1-g) \cdot FR}{p} n_{\tilde{g}} \left\{ 1 - \frac{1}{K R_{\tilde{g}}} \cdot \frac{1-\alpha}{\alpha} \left[\frac{(1-S_K) K_e + (1-S_A) A_e}{S_e} \right] \right\} \quad (11.7)$$

where $n_{\tilde{g}} = \frac{(p_0 - AC_{\tilde{R}}) Q_0}{P_0 \cdot Q_0}$ is the pre-entry price-cost margin of the incumbents and $s_e = s_{P_0} \cdot \tilde{q}_e$. Note that the first term $\frac{g - \tilde{g}}{q_e/Q_0}$ in the above equation indicates the number of new firms that could fit in the industry due to demand growth without depressing the price or capturing sales away from the incumbents. The $(1-g)$ factor in the second term expresses the fact that, again because of growth in demand, the additional output supplied to the market will depress price at a slower rate.

effect on sales and therefore has to be considered as an investment in a capital asset. For the prospective entrant, the act of entry requires the conversion of liquid assets into advertising capital which is completely non-salvageable if the entrant is forced to exit. This need to sink the a

largely established. While their further participation in the market is not without risks, it can be reasonably assumed nevertheless that their continued operation with established products exposes them to a smaller peril than the new entrant with an untested product and no consumer experience. In the extreme case, for an incumbent who is beyond the regime of failure (i. e. $4G, G1$), advertising enters only in AC^T and is thus a normal cost of doing business.

It is in this sense that advertising constitutes a sunk cost barrier to entry. It is important to note that economies of scale in advertising or the possibility that a new entrant might have to advertise more than the incumbents (per unit of sales) to overcome the consumer inertia are not necessary conditions for advertising to constitute an entry barrier. Even if there were no economies of scale or consumer inertia, advertising would still give rise to an entry barrier because of the above-mentioned asymmetry in the costs and risks to a new entrant and the incumbents. Notwithstanding this, the existence of economies of scale and consumer brand loyalty certainly would accentuate this asymmetry.

The advertising by incumbents may simply reflect profit-maximizing behavior. In such a case a sunk cost entry barrier is unintentionally erected. On the other hand, incumbents who attempt to exploit their leadership role in order to thwart entry might view advertising as an instrument of deterrence.¹² For them, advertising represents a binding commitment which the entrant must match, conceivably making his entry unprofitable. The sunk cost effect of advertising could therefore already reflect this strategic choice.

Hypothesis 1

For the potential new entrant, the required investment in advertising leads to an unrecoverable entry cost in the case of failure -- thus, advertising creates a sunk cost barrier to entry.

The Effect of Advertising on the Risk of Entry

The height of the barrier which sunk costs are hypothesized to erect depends on the risk they expose the entrant to -- as the term

$$1-a \cdot \frac{<1- S_K}{\text{-----}}$$

$$\frac{\partial}{\partial \left(\frac{A}{S}\right)} \left(\frac{1 - \alpha}{\alpha} \right) < 0$$

where $\frac{A}{S}$ is the advertising intensity (advertising to sales ratio) in a given market.

III. Data and Measurement Problems

Our sample consists of all the 4 digit U.S. manufacturing industries which experienced net entry between the census years 1972 and 1977. There were 266 such industries. ¹⁴

The Appendix provides the definitions and sources of the variables used in this paper. We restrict our attention below to those variables which entail measurement and definitional difficulties.

Price-Cost Margin

The theory underlying this model suggests that the pre-entry price-cost margin of the incumbents is a pertinent variable in an equation explaining entry. We modify the traditional measure of this variable (value added minus payroll divided by sales) commonly employed as a proxy for profitability in inter-industry studies by taking into account capital costs. These costs include both depreciation and the opportunity cost of capital. In addition, in this corrected measure of the margin, advertising expenditures are capitalized rather than treated as current expenses.

The corrected definition of the price-cost margin for the *i*th 4 digit industry is

$$\frac{VA_o^i - W_o^i - (r + \lambda_M^i) \cdot M_o^i - (r + \lambda_B^i) \cdot B_o^i - (r + \lambda_A^i) \cdot A_o^i}{S_o^i}$$

and buildings; A_{+G}^i - s advertising expenditures; and s^i

Scale of Entry

We construct a proxy for the scale of entry, MS_e , in each industry using the available distribution of plants within the industry according to employment size. Let n_j and S_j denote the number of plants and total sales of the j th size group, respectively. Also, let m denote the number of group sizes within the industry. Then we use as our proxy the following measure:

$$MS_e = S_e / S_0$$

where $S_e = \frac{1}{m} \sum_{j=1}^m S_j$, $n_j = \frac{S_j}{\bar{s}_j}$ and $\bar{s}_j = \frac{S_j}{n_j}$

Our measure is therefore the simple average of the representative plants of each size group.⁶

Entry

The constraints imposed by the availability of data permit only a measure of net entry between the census years:

$$N_e^i = N_{66}^i - N_{6+}^i$$

where N^i is the number of firms in the i th industry in '66 and '6+ respectively. Such a measure does not capture such factors as entry and subsequent exit within the inter-census interval nor does it capture entry by acquisition or vertical integration.⁷ However, our estimates will not be affected if we assume that these factors are small in comparison or proportional to net entry, or simply random with respect to the right-hand side variables in our equation.

IV. Specification and Estimation

This is a single equation

demand for the industry's product and expected expansion by the incumbents, respectively; $\frac{1-a}{a}$, the perceived relative probability of failure; and $SU_e = (1-S_K) \cdot s_e^{K_e} + (1-S_A) \cdot s_e^{A_e}$, the unrecoverable portion of the original investment in the event of exit (sunk cost).

The structural characteristics of the model imply that cross-industry inference is appropriate. We therefore propose a cross-sectional test of our model. Our hypotheses will be formulated in two forms. The first form will be a set of parametric restrictions testing the effects of σ , MS_e , β , g and \bar{g} . The second form will consist of the explicit parametrization of sunk costs SU_e and the risk of entry $\frac{1-a}{M}$. Such a parametrization will permit us to identify the separate effects of advertising implied by our model.

To test Hypothesis 1, we impose on the irrecoverable costs of entry the functional form

$$SU_e = a_1 \cdot SI_e + a_2 \cdot SA_e \quad (IV. 1)$$

where SI_e and SA_e provide a measure of the portion of the original investment in machines and advertising which is sunk in the event of exit. 19

To discriminate between Hypotheses 2a and 2b, we need first an appropriate specification for the "perceived" probability of success, a . The logistic function provides a particularly convenient basis for such a specification. We therefore propose the following log-linear relationship to describe the odds of entry failure: 20

$$\ln\left(\frac{1-a}{a}\right) = s_0 + s_1 \ln n_0 + s_2 \ln c_0 + s_3 \ln\left(\frac{A_0}{S_0}\right) \quad (IV. 2)$$

where C_0 and A_0/S_0 represent the industry's pre-entry level of structural concentration and advertising intensity, respectively. This specification will also permit the testing of the following hypotheses:

thus, $\forall R \in \mathcal{R}$.

Finally, given that our simple theory does not generate completely specified empirical tests, we attempt to assess the robustness of any predictions based on such tests to

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suggests that advertising gives rise to a sunk cost barrier to entry. In addition, the fact that q_{GR} is found to be

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Our analysis establishes the presence of two countervailing effects of advertising on entry. On the one hand, advertising impedes entry because

Conclusions

The paper attempts to provide a direct test of hypothesis that advertising serves as a barrier to new competition. The role of advertising as a potential barrier to entry is explored in the context of a simple model of entry behavior. Such a model isolates three separate effects of advertising on entry: the effect on the measured rates of profit, the effect on the irreversible costs of entry, and the effect on the uncertainty underlying the environment faced by potential entrants.

The empirical estimates show that for the potential entrant, the need to advertise leads to an unrecoverable entry cost in the case of failure and thus advertising creates a sunk cost barrier to entry. However, our estimates also establish the presence of countervailing force due to advertising. We find that entrants perceive a greater likelihood of success in markets where advertising plays an important role.

Our findings indicate that for the majority of the industries examined, the overall impact of advertising on entry is positive, that is advertising actually facilitates entry. This evidence raises new questions about the appropriate interpretation on the observed positive correlation between advertising intensity and profitability in the cross-section.

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Table 3

$$n_e - e^{+\frac{g}{1+g}} \frac{I_{+G}^0}{MES_e} [1 - \frac{1}{I_{+G}} (a_1 \text{SUM}_e + a_2 \text{SUA}_e) I_{+G}^{\delta_1} c_{+G}^{\delta_2} \frac{A}{P_s} R_{+G}^{\delta_3}] e^u$$

$$\frac{A}{S_{+G}} \cdot .01$$

Parameter	θ_{+G}	a_1	a_2	δ_1	δ_2	δ_3
Estimates	1.939 (.287)	.001 (.0009)	1.186 (.125)	1.065 (.075)	.090 (.068)	-1.113 (.033)

Asymptotic Standard Errors in Parentheses
 Annual Depreciation Rate of Advertising: $\frac{A}{A} = .5$
 Number of Observations = 262

FOOTNOTES

1. Conanor and Wilson (1979) provide an overview of the literature.
2. There is some controversy regarding the importance of economies of scale in advertising. See Conanor and Wilson, supra note 1, and the references cited therein.
3. See Scherer Ch. 9 and Conanor and Wilson, supra note 1.
4. Bloch (1974) and Ayanian (1975) purport to show that the correlation between advertising and profitability becomes insignificant once advertising outlays are capitalized. Densetz (1979) also claims that the observed correlation is explainable in terms of accounting practices. However, Weiss (1969) and Conanor and Wilson (1974) reach different conclusions. Regarding the difficulty of interpreting such a correlation in the cross-section, see Spence (1980).

12. See Salop (1979). It is important to recognize that the effectiveness of any pre-entry commitment in capital by the incumbents as an instrument of deterrence will depend on the rate of depreciation of the said capital. If this rate is very high then such commitment will not be entry-detering.
13. See Schmalensee (1974).
14. The exclusion of those industries which experienced net exit might be perceived as leading to a sampling bias. It should be noted however that entry and exit are not necessarily symmetric (exit is not a symmetrical function of entry barriers). Thus, a more complete approach to the problem would entail a separate equation explaining exit.
15. See Grabowski and Mueller (1978).
16. Because the service lives of assets (machines and buildings) are reduced for tax purposes, we use tax depreciation rather than the true economic depreciation for constructing these proxies of sunk costs.
17. It is assumed here that there is no a priori strong basis for assigning probabilities of entry into each of the size groups.
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24. Note that since σ_{+G}^2 is suppressed into the error term $\sigma_{+G}^2 = 1$ is no longer a maintained hypothesis.

25. $T_{+G} = \frac{\hat{\sigma}_{+G}^2}{\hat{\sigma}_G^2} = \frac{4.026}{3.965} = 1.015 < c^* = 1 + \frac{3}{253} F_{253}^{.95} = 1.031$

where $\hat{\sigma}_{+G}^2$ and $\hat{\sigma}_G^2$ are the maximum likelihood estimates of variance in Tables Ia and Ib respectively. Thus the maintained Hypothesis is not rejected at the 5 percent level.

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Appendix

Definition of Variables

<u>Abbreviated Name</u>	<u>Definition</u>	<u>Source</u>
N_{72}	Number of firms in 1972	1972 Census of Manufacturers
N_{77}	Number of firms in 1977	1977 Census
	Industry advertising expenditures	1972 Input-Output Tables for the U.S. and 1974 Annual Line of Business Report
	Fixed depreciable assets in the form of buildings and structures	1971 Annual Survey of Manufacturers
	Fixed depreciable assets in the form of machines and equipment	1971 Survey
	Depreciation rate for advertising	set at .4
	Depreciation rate for buildings and structures (total industry tax depreciation charges for buildings and structures divided by fixed assets in this form)	1977 Census
	Depreciation rate for machines and equipment (calculated in the same manner as above)	1977 Census
	Expected sales of an entrant (simple average of all the representative plants from the shipment's size distribution)	1972 Census
	Total industry sales	1972 Census
$M S_e^* S_e / S_o$	Scale of entry	derived
g	Industry sales in 1972 divided by sales in 1967 minus 1.00 (growth in demand)	1972, 1967 Censuses
C_o	Four-firm concentration ratio	1972 Census
