

The Economic Analysis of Advertising
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1. Introduction (pages 1-6)
2. Views on Advertising (pages 6-25)
 - 2.1. Setting the Stage
 - 2.2. The Persuasive View
 - 2.3. The Informative View
 - 2.4. The Complementary View
 - 2.5. Summary
3. Empirical Regularities (pages 26-54)
 - 3.1. The Direct Effects of Advertising
 - 3.1.1. Sales
 - 3.1.2. Brand Loyalty and Market-Share Stability
 - 3.1.3. Advertising Scale Economies
 - 3.2. The Indirect Effects of Advertising
 - 3.2.1. Concentration
 - 3.2.2. Profit
 - 3.2.3. Entry
 - 3.2.4. Price
 - 3.2.5. Quality
 - 3.3. Summary
4. Monopoly Advertising (pages 54-69)
 - 4.1. The Positive Theory of Monopoly Advertising
 - 4.1.1. The Dorfman-Steiner Model
 - 4.1.2. Two Examples
 - 4.2. The Normative Theory of Monopoly Advertising
 - 4.2.1. The Persuasive View
 - 4.2.2. An Alternative Approach
 - 4.2.3. Price-Maintaining and Price-Decreasing Monopoly Advertising
 - 4.2.4. Price-Increasing Monopoly Advertising
 - 4.3. Summary
5. Advertising and Price (pages 69-83)
 - 5.1. Homogenous Products
 - 5.2. Differentiated Products
 - 5.3. Non-Price Advertising
 - 5.4. Loss Leaders
 - 5.5. Summary
6. Advertising and Quality (pages 83-103)
 - 6.1. Signaling-Efficiency Effect

- 6.2. Repeat-Business Effect
- 6.3. Match-Products-to-Buyers Effect
- 6.4. Quality-Guarantee Effect
- 6.5. Summary

- 7. Advertising and Entry Deterrence (pages 103-116)
 - 7.1. Advertising and Goodwill
 - 7.2. Advertising and Signaling
 - 7.3. Summary

- 8. Empirical Analyses (pages 116-128)
 - 8.1. Advertising and the Household
 - 8.2. Advertising and Firm Conduct
 - 8.3. Summary

- 9. Sunk Costs and Market Structure (pages 128-136)
 - 9.1. Main Ideas
 - 9.2. Econometric Tests and Industry Histories
 - 9.3. Related Work
 - 9.4. Summary

- 10. Other Topics (pages 136-137)

- 11. Conclusion (pages 137-138)

- 12. References (pages 138-164)

Figures 1-5b

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“What makes the advertising issue fascinating...is that it is fundamentally an issue in how to establish truth in economics.” (Phillip Nelson, 1974a)

1. Introduction

By its very nature, advertising is a prominent feature of economic life. Advertising reaches consumers through their TV sets, radios, newspapers, magazines, mailboxes and more. Not surprisingly, the associated advertising expenditures can be huge. For example, *Advertising Age* (2002) reports that, in 2001, General Motors spent \$2.14 billion to advertise its cars and trucks; Procter and Gamble devoted \$1.69 billion to the advertisement of its detergents and cosmetics; and Philip Morris incurred a \$1.32 billion advertising expense for its cigarettes and beer. Advertising is big business indeed.

From the current perspective, then, it is perhaps surprising to learn that the major economists of the 19th century and before paid little or no attention to advertising.¹ The economic analysis of advertising is almost entirely a 20th-century project. Why didn't 19th-century economists analyze advertising (and promotion, more generally)? Two reasons stand out.

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¹Ekelund and Saurman (1988) discuss early views on advertising by economists.

First, 19th-century economic research is devoted largely to the development of the theory of perfect competition, and this theory does not immediately suggest a role for advertising. As Pigou (1924, pp. 173-4) remarks, “Under simple competition there is no purpose in this advertisement, because, *ex hypothesi*, the market will take, at the market price, as much as any one small seller wants to sell.” Of course, whether a firm is competitive (i.e., price-taking) or not, it might advertise if it were thereby able to shift its demand curve upward so that a higher price could be obtained. But here a more basic problem arises: under the conventional assumptions that consumers have fixed preferences over products and perfect information with regard to prices and qualities, there is no reason for consumers to respond to advertising, and so the posited demand shift is unjustified.²

Second, while advertising has long been used by merchants, its transition to “big business” is more modern. In the late 19th and early 20th centuries, following significant advances in transportation (railroads) and communication (telegraph) networks, manufacturers were motivated to pursue innovations in the machinery of production and distribution, so that economies of scale could be reaped. These economies, however, could be achieved only if demand were appropriately stimulated. The turn-of-the-century technological innovations that are associated with mass production and distribution thus gave significant encouragement to large-scale brand advertising and mass marketing activities.³

At the beginning of the 20th century, advertising was thus a ripe topic for economic research. The economic analysis of advertising begins with Marshall (1890, 1919), who offers some insightful distinctions, and then gathers important momentum with Chamberlin’s (1933) integration of selling costs into economic theory. Over the second half of the century, the economic analysis of advertising has advanced at a furious pace. Now, with the close of the 20th century, a substantial literature has emerged. My purpose here is to survey this literature.

In so doing, I hope to accomplish two objectives. A first objective is to organize the literature in a manner that clarifies *what* is known. Of course, it is impossible to summarize all of the economic studies of advertising. Following a century of

²As Braithwaite (1928, p. 28) explains: “Under conditions of perfect competition producers would gain nothing by spending money on advertisement, for those conditions assume two things - (1) that the demand curve is fixed and cannot be altered directly by producers, and (2) that since producers can sell all that they can produce at the market price, none of them could produce (at a given moment) more at that price than they are already doing.”

³The emergence of large-scale advertising is also attributable to income growth, printing and literacy advances, and urbanization. See also Borden (1942), Chandler (1990), Harris and Seldon (1962), Pope (1983), Simon (1970) and Wood (1958).

work, though, this seems a good time to bring to the surface the more essential contributions and take inventory of what is known. Second, I hope to clarify *how* this knowledge has been obtained. The economic implications of advertising are of undeniable importance; however, the true nature of these implications has yielded but slowly to economic analysis. There is a blessing in this. With every theoretical and empirical methodological innovation in industrial organization, economists have turned to important and unresolved issues in advertising, demonstrating the improvements that their new approach offers. Advertising therefore offers a resilient set of issues against which to chart the progress gained as industrial organization methods have evolved.

In considering the economic analysis of advertising, it is helpful to begin with a basic question: Why do consumers respond to advertising? An economic theory of advertising can proceed only after this question is confronted. As economists have struggled with this question, three views have emerged, with each view in turn being associated with distinct positive and normative implications.

The first view is that advertising is *persuasive*. This is the dominant view expressed in economic writings in the first half of the 20th century. The persuasive view holds that advertising alters consumers' tastes and creates spurious product differentiation and brand loyalty. As a consequence, the demand for an advertising firm's product becomes more inelastic, and so advertising results in higher prices. In addition, advertising by established firms may give rise to a barrier to entry, which is naturally more severe when there are economies of scale in production and/or advertising. The persuasive approach therefore suggests that advertising can have important anti-competitive effects, as it has no "real" value to consumers, but rather induces artificial product differentiation and results in concentrated markets characterized by high prices and profits.

The second view is that advertising is *informative*. This view emerged in force in the 1960s, under the leadership of the Chicago School. According to this approach, many markets are characterized by imperfect consumer information, since search costs may deter a consumer from learning of each product's existence, price and quality. This imperfection can lead to market inefficiencies, but advertising is not the cause of the problem. Instead, advertising is the endogenous response that the market offers as a solution. When a firm advertises, consumers receive at low cost additional direct (prices, location) and/or indirect (the firm is willing to spend on advertising) information. The firm's demand curve becomes more elastic, and advertising thus promotes competition among established firms. As well, advertising can facilitate entry, as it provides a means through which a new

entrant can publicize its existence, prices and products. The suggestion here, then, is that advertising can have important pro-competitive effects.

A third view is that advertising is *complementary* to the advertised product. According to this perspective, advertising does not change consumers' preferences, as in the persuasive view; furthermore, it may, but need not, provide information. Instead, it is assumed that consumers possess a stable set of preferences into which advertising enters directly in a fashion that is complementary with the consumption of the advertised product. For example, consumers may value "social prestige," and the consumption of a product may generate greater prestige when the product is (appropriately) advertised. An important implication is that standard methods may be used to investigate whether advertising is supplied to a socially optimal degree, even if advertising conveys no information.

These views are all, at some level, plausible. But they suggest dramatically different positive and normative implications. The persuasive and informative views, in particular, offer conflicting assessments of the social value of advertising. It is of special importance, therefore, to subject these views to rigorous empirical and theoretical evaluation. Over the past fifty years, the economic analysis of advertising, like the field of industrial organization itself, can be described in terms of a sequence of empirical, theoretical and again empirical evaluative phases.

The empirical analysis of advertising was at center stage from the 1950s through the 1970s. Over this period, a voluminous literature sought general empirical relationships between advertising and a host of other variables, including concentration, profit, entry and price. Much of this work employs regression methods and uses (government-supplied) inter-industry data, but important studies are also conducted at the industry, firm and even brand levels. This period is marked by vigorous and mostly edifying debates between advocates of the persuasive and informative views. The debates center on both the robustness and the interpretation of empirical findings, and they identify some of the limitations of regression analyses, particularly at the inter-industry level. While the inter-industry analyses are often inconclusive, defensible empirical patterns emerge within particular industries or narrow industry categories. The evidence strongly suggests that no single view of advertising is valid in all settings.

The empirical studies suggest important roles for advertising theory. First, theoretical work might make progress where empirical work has failed. A general theoretical argument might exist, for example, that indicates that advertising is always excessively supplied by the market. Likewise, a theoretical model might assess the validity of the persuasive-view hypothesis that advertising deters entry.

Second, advances in the theory of advertising might generate new predictions as to the relationships between advertising activity and market structure. In turn, these predictions could motivate new empirical work. Third, and relatedly, theoretical work might provide a foundation from which to appropriately specify the supply side of more sophisticated econometric analyses, in which the endogeneity of consumer and firm conduct is embraced. Utilizing recent advances in game theory, economists thus began in the late 1970s to advance the formal theory of advertising conduct. This work is vital and ongoing.

Beginning in the 1980s, economists approached the empirical analyses of advertising with renewed interest. For the purposes of this survey, it is useful to organize the modern work in three broad groups. Studies in the first group often use new data sources and further evaluate the empirical findings of the earlier empirical work. These studies are not strongly influenced by the intervening theoretical work. Studies in the second group also draw on new data sets, sometimes constructed at the brand and even household levels, and reflect more strongly the influence of the intervening theoretical work. The conduct of firms and consumers in particular industries is emphasized. Studies in this group evaluate the predictions of strategic theories of advertising, and may even specify and estimate explicit structural models of consumer and firm conduct. Finally, following Sutton (1991), a third group of studies culls from the intervening theoretical work a few robust predictions that might apply across broad groups of industries. Studies in the third group thus sometimes return to the inter-industry focus that characterized much of the earlier empirical work; however, the empirical analysis is now strongly guided by general theoretical considerations.

This historical description provides a context from which to understand the organization of this survey. In Section 2, I describe the work of Marshall (1890, 1919) and Chamberlin (1933), and I review the key initial writings that are associated with each of the three views. This discussion is developed at some length, since these writings contain the central ideas that shape (and are often re-discovered by) the later literature. Section 3 contains a summary of the findings of the initial and modern (first-group) empirical efforts.⁴ In Sections 4 through 7, I present research on advertising theory. Next, in Section 8, I describe the modern (second-group) empirical efforts. The modern (third-group) work is discussed in Section 9. Section 10 identifies some omitted topics, and Section 11 concludes.

⁴It is not always clear whether a study belongs in the first or second group. When there is any ambiguity, I place the study in the first group, so that the topic treatments found in Section 3 may be more self contained.

The survey is comprehensive and thus long. The sections are organized around topics, however, making it easy to locate the material of greatest interest. For teaching purposes, if a thorough treatment of advertising is planned, then the survey may be assigned in full. Alternatively, if the plan is to focus on a particular topic within advertising, then Section 2 and the section that covers the corresponding topic may be assigned. Section 2 provides a general context in which to understand any of the topic treatments found in later sections.

2. Views on Advertising

In this section, I discuss the key initial writings that led to each of the three main views (persuasive, informative, complementary) of advertising. The assignment of economists to views is, to some degree, arbitrary, as it is commonly recognized that advertising can influence consumer behavior for different reasons. There are, however, important differences in emphasis among many of the key contributors. I begin with Marshall (1890, 1919) and especially Chamberlin (1933), who “set the stage” by identifying some of the possible views and implications of advertising. I then review the key contributions that emphasize more forcefully the development of one view over another. The section concludes with a general discussion that inventories the potential social benefits and costs of advertising.

2.1. Setting the Stage

Some initial reflections on advertising are offered by Marshall (1890, 1919). As Marshall (1919) explains, advertising can play a *constructive role* by conveying information to consumers. Constructive advertising can alert consumers to the existence and location of products, and it can also convey (pre-purchase) information concerning the functions and qualities of products. Marshall (1919, p. 305) argues that such information is useful to consumers, because it enables them to “satisfy their wants without inordinate fatigue or loss of time.” But Marshall (1890, 1919) also emphasizes that some kinds of advertising can be socially wasteful. In particular, some advertising involves repetitive messages, and such advertising plays a *combative role*, as its apparent purpose is to redistribute buyers from a rival firm to the advertising firm.⁵

⁵Along with Marshall (1890, 1919), other early contributors to the economic analysis of advertising include Fogg-Meade (1901), Pigou (1924), Shaw (1912), Sherman (1900) and Shryer (1912). Fogg-Meade argues that advertising is a positive force for society, since it educates

Unfortunately, Marshall did not pursue a formal integration of advertising into economic theory. With the development of his theory of monopolistic competition, however, Chamberlin (1933) embraces this integration. Indeed, Chamberlin (1961, p. 529) recalls his perception at the time in the following terms: with respect to the phenomenon of advertising, “the neglect by theoretical economics of a force of such overwhelming importance in the real world had long seemed to me an anomaly;” and he recalls further the “conviction that advertising was a *necessary* part of the hybrid theory” that he sought to develop.

Fundamental to Chamberlin’s approach is the assumption that, within a given industry, firms sell differentiated products. As a consequence, each firm faces a downward-sloping demand curve and thus possesses some monopoly power. Chamberlin argues additionally that a firm can use advertising and other promotional activities to further differentiate its product from those of its rivals. Advertising-induced product differentiation is beneficial to a firm as a means of expanding its market; in graphical terms, by advertising, a firm generates an outward shift in its demand curve. When a firm considers increasing its advertising, it thus balances this market-expansion benefit against the additional “selling costs” that such an increase would entail.

Chamberlin does not model consumer behavior directly, and he takes as given that consumers respond to advertising. He does, however, offer two explanations for the presumed responsiveness. Chamberlin (1933, pp. 118-120) argues that advertising affects demand, because it (i) conveys information to consumers, with regard to the existence of sellers and the price and qualities of products in the marketplace, and (ii) alters consumers’ “wants” or tastes. When advertising communicates information that concerns the existence of the firm’s product, the effect is to expand the firm’s market with an outward shift in demand. If advertising conveys price information as well, then the firm’s expanded demand curve also may be more elastic, as more consumers then can be informed of a price reduction. But if advertising serves its second general purpose - that of creating wants through brand development and the like - then the advertising firm’s demand

consumers by bringing new goods to their attention. Pigou emphasizes that much advertising is combative and thus socially wasteful. Shaw argues that advertising enables manufacturers to by-pass the middleman and establish their brand names with consumers. Advertising thus gives manufacturers incentive to maintain reputations for high quality. Sherman details the extent and nature of advertising in the U.S. in the 19th century. He also observes that advertising can play constructive and combative roles. Shryer offers one of the first quantitative studies of advertising. Using mail-order data, he argues that the effect of advertising on sales exhibits decreasing returns.

curve shifts out and may be made more inelastic. Chamberlin thus identifies the potential informative and persuasive roles for advertising.

Scale economies figure prominently in Chamberlin's approach. First, Chamberlin assumes that a firm's production technology is characterized by increasing returns to scale up to a critical level of output. Second, Chamberlin (1933, pp. 133-36) stresses as well that there may be an economy of scale in advertising. To motivate this scale economy, Chamberlin argues that (i) a consumer's responsiveness to advertising messages may be "fortified by repetition," and (ii) there may be improvement in the organization of advertising expenditures at higher levels, as gains from specialization in selling are realized and as more effective media (which may be accessible only at higher expenditures) are used. At the same time, beyond a critical sales volume, diminishing returns are inevitable, since additional advertising becomes less effective once the most responsive buyers are already reached. In total, Chamberlin concludes that the unit costs of production and selling are each U-shaped, and on this basis he argues that a firm's combined unit cost curve is U-shaped as well.

Using these ingredients, Chamberlin describes a monopolistic-competition equilibrium, in which each firm sets its monopoly price and yet earns zero profit. As the standard textbook diagram depicts, at the firm's monopoly price, its downward-sloping demand curve is just tangent to its combined unit cost curve. Chamberlin argues that this tangency is a necessary consequence of the competitive forces of entry. In this general manner, Chamberlin reconciles monopolistic and competitive forces, by introducing a modeling paradigm that emphasizes product differentiation, scale economies and advertising.

In an important application of his framework, Chamberlin (1933, pp. 165-7) considers the possible price effects of advertising. He compares the monopolistic-competition equilibrium when advertising is allowed with the corresponding equilibrium that would emerge if advertising were not allowed. On the one hand, the demand-expanding effect of advertising enables firms to better achieve economies of scale in production, and this *scale effect* works to reduce prices.⁶ On the other hand, advertising entails selling costs, and so a firm's combined unit cost is higher when advertising is permitted. In a zero-profit equilibrium, this *cost effect* works to increase prices. Finally, advertising affects pricing as well through an *elasticity effect*. When advertising increases the elasticity of a firm's demand, as advertising might when it contains price information, there is further support for the sugges-

⁶Marshall (1890, Chapter XIV) also briefly discusses the possibility that advertising induces a beneficial scale effect.

tion that advertising reduce prices.⁷ Of course, the opposite suggestion is given further credence, if advertising makes the firm's demand less elastic, as advertising might when it creates wants and encourages brand loyalty.

In light of these conflicting effects, Chamberlin (1933, p. 167) concludes that the net effect of advertising on prices cannot be resolved by theory alone: "The effect of advertising in any particular case depends upon the facts of the case." Among these facts, Chamberlin's discussion clearly suggests that the purpose of advertising (persuasive or informative) and the extent of scale economies (in production and advertising) warrant greatest attention. This is a balanced and penetrating suggestion. It also serves to provide a general context from which to understand subsequent research, wherein economists debate the purpose of advertising and the probable extent of scale economies.

2.2. The Persuasive View

In the writings that initially followed Chamberlin's effort, advertising's persuasive powers are given primary emphasis. These writings acknowledge a role for scale economies, under which advertising may exert a price-reducing influence, but the conclusion that emerges is that advertising may have important anti-competitive consequences. In arriving at this conclusion, the persuasive-view advocates go beyond Chamberlin to emphasize that advertising has an *entry-deterrence effect*: when advertising creates brand loyalty, it also creates a barrier to entry, since established firms are then able to charge high prices and earn significant profits without facing entry. As I describe below, the persuasive view is developed through an increasingly sophisticated set of conceptual and empirical arguments.

In fact, the first advocates of the persuasive view were contemporaries of Chamberlin's. In her development of the theory of imperfect competition, Robinson (1933, p.5) includes some brief discussion of advertising, in which she argues that "the customer will be influenced by advertisement, which plays upon his mind with studied skill, and makes him prefer the goods of one producer to those of another because they are brought to his notice in a more pleasing and forceful manner." Likewise, in considering the potential anti-competitive implications of advertising, Robinson (1933, p.101) claims that if "a firm finds the market becoming uncomfortably perfect (i.e., more competitive) it can resort to advertisement

⁷As Chamberlin (1933, p. 118-19) puts it, "Imperfect knowledge (of prices) makes the demand curves for products less elastic; advertising, through offsetting it, makes them more so. It offers greater opportunities for price competition, but at an added cost which must be covered by the price."

and other devices which attach customers more firmly to itself.” In total, Robinson suggests that advertising has strong anti-competitive consequences, since it deters entry and sustains monopoly power in a market where the conduct of established firms otherwise would be suitably disciplined by competitive pressures.

In a perceptive paper that, unaccountably, now seems largely forgotten, Braithwaite (1928) contributes significantly toward a conceptual foundation for the persuasive view.⁸ Braithwaite regards advertising as a “selling cost,” the purpose of which is to re-arrange consumers’ valuations, so that they are persuaded to value more greatly the advertised product. Advertising shifts out a consumer’s demand for the advertised product, and it thus distorts the consumer’s decisions as compared to those that reflect his “true” preferences (as captured in the pre-advertising demand). The real economic resources that are expended through advertising activities thus may be wasted, since advertising’s effect is to induce consumers to purchase the wrong quantities of goods that are not well adapted to their true needs at prices that are swollen from the cost effect of advertising. On the other hand, Braithwaite recognizes that advertising may also induce a scale effect that exerts a downward pressure on price.

In light of these competing influences, Braithwaite (1928, p. 35) establishes the following result: if a monopolist’s advertising shifts out the demand for its product, and if consumer surplus is evaluated relative to the initial (pre-advertising) demand, then advertising increases consumer surplus *only if* it is accompanied by a strict reduction in price. Figure 1 illustrates that consumer surplus may fall, even if there is a strict reduction in price. The consumer surplus gain from a lower price is marked as G, while the consumer surplus loss that comes from distorted consumption is marked as L. Certainly, L can exceed G if the price decrease is modest, and L necessarily exceeds G if price is unaltered.

Braithwaite also advances the entry-deterrence effect of advertising. She argues that, by advertising, an established firm creates a “reputation” for its brand among consumers. New entrants can then succeed only by developing their own reputation through advertising, and Braithwaite (1928, p. 32) claims that for them the necessary expenditures may be even higher: “But, since they have to create reputation in the face of one already established, the probability is that their advertisement costs will be heavier than those of the original manufacturer.” Advertising thus may result in the creation of “reputational monopolies.” This entry-deterrence effect offers further support for the belief that advertising causes

⁸Braithwaite (1928) and Chamberlin (1933) cover some similar terrain, and the contributions appear to be independent (see Chamberlin (1933, p. 126)).

higher prices and lower welfare.

Finally, Braithwaite (1928, p. 36) considers whether reputation itself may confer some possible benefit to the consumer. She states one possibility: “Advertisers maintain that their reputation is a guarantee of quality. For they say that it is not worth a manufacturer’s while to stake his name and spend his money on advertising an article of poor quality.” In the end, she argues that the *quality-guarantee effect* is modest.⁹ Her reasons are that: (i) factually, reputations are sometimes created for inferior goods which enjoy short-lived profits, (ii) consumers can be poor judges of quality, and they may linger with an inferior product, and (iii) any such guarantee is to some degree redundant, since a reliable retailer already offers an implicit guarantee as to the quality of products sold in his store. In view of these considerations, Braithwaite (1928, p. 37) concludes that reputation does not offer advantages to consumers that are sufficient to compensate for the harmful effects of advertisement that she otherwise identifies.

The persuasive view of advertising is further advanced by Kaldor (1950). He draws a distinction between the direct and indirect effects of advertising on social welfare. The direct effect of advertising is associated with its role in the provision of price and product-quality information to consumers, while the indirect effects of advertising include any consequent scale economies in production and distribution.

Kaldor begins with the direct effect. Observing that the “price” of advertising to the buyer is typically zero, Kaldor regards advertising as a subsidized commodity (i.e., a commodity sold below marginal cost) that is sold jointly with the advertised product. Advertising is then profitable to the seller, because it is “complementary” to the advertised product (i.e., advertising increases the demand for the advertised product). As Kaldor explains, given the absence of a separate market for advertising and the associated divergence between price and marginal cost, there can be no presumption that the amount of advertising is efficient. Moreover, while advertising can convey information, this information is offered by an interested party. Kaldor (1950, p. 7) thus argues that the majority of advertising is persuasive in nature. After considering the direct effect of advertising, Kaldor suggests that advertising is a wasteful means of conveying a modest degree of information.

If advertising is to be justified, then the justification must come from its indirect effects. Here, the core of Kaldor’s argument is that advertising promotes

⁹Fogg-Meade (1901), Marshall (1919) and Shaw (1912) are early proponents of the quality-guarantee effect. In contrast to Braithwaite (1928), they suggest that advertising and trademarks can greatly enhance the incentive for manufacturers to offer high-quality products.

greater concentration; hence, the primary indirect effects of advertising are the same as those that are associated with increased concentration. The indirect effects thus can cut both ways. On the one hand, there may be a detrimental elasticity effect: greater advertising may lead through greater concentration to enhanced monopoly power and the loss in efficiency that such power portends. On the other hand, there may be a beneficial scale effect: greater advertising and the increased concentration that it implies may give rise to an efficiency gain, due to achievement of scale economies in production and/or distribution.

On what basis does Kaldor conclude that advertising promotes greater concentration? To develop this position, Kaldor assumes that an economy of scale to advertising exists and that larger, more profitable firms are better able to finance larger advertising expenditures. Kaldor (1950, p. 13) then argues that advertising introduces an instability in the initial distribution of market shares, “with the consequence (a) that the larger firms are bound to gain at the expense of the smaller ones; (b) if at the start, firms are more or less of equal size, those that forge ahead are bound to increase their lead, as the additional sales enable them to increase their outlay still further.” This *concentration effect* of advertising continues until an oligopolistic structure emerges. According to Kaldor, there are two reasons that the process halts before a monopoly structure is achieved. First, advertising eventually becomes subject to diminished returns. Second, at some point, each firm resists any intrusion into its market, being prepared to increase its own advertising in response to any increase in advertising by another firm.

I return now to Kaldor’s comparison of indirect effects. Given that these effects are competing, Kaldor reaches the same conclusion as did Chamberlin before him: the net social consequence of advertising cannot be decided on the basis of economic theory alone. To gain further insight, Kaldor considers the role of advertising in Britain in the late 19th century. In Kaldor’s view, the advent of large-scale advertising contributed to the emergence of a new organizational structure, which he calls “manufacturers’ domination.” Manufacturers used advertising to establish brand names and position those names in the foreground of the consumers’ consciousness, so that consumers would be persuaded to seek these brands. In this way, large-scale advertising enabled manufacturers to leap over wholesalers and establish a direct connection with final consumers.¹⁰ The manufacturing sector then became more concentrated, and additional scale economies (associated with mass-production techniques) were realized. The manufacturers’ domination

¹⁰Similar observations are made in other early efforts. See Borden (1942), Braithwaite (1928), Chamberlin (1933), Fogg-Meade (1901), Marshall (1919), Shaw (1912) and Tosdal (1918).

structure is thus characterized by low production costs and high selling costs. As Kaldor acknowledges, his informal study does not afford a conclusive assessment as to advertising's indirect effects. In the main, though, he seems skeptical that manufacturer advertising can be justified by its indirect effects.

The persuasive view next proceeds along two tracks. One set of work embarks on a broad assessment of the social consequences of advertising. Notably, Galbraith (1958, 1967) and Packard (1957, 1969) propose a very negative view of advertising, wherein the institution of modern advertising arises with the purpose of creating wants among a population of passive consumers. I emphasize here a second set of work. This work offers an empirical assessment of the implications of the persuasive view. Persuasive advertising instills brand loyalty and is thus expected to exert an indirect influence on other market variables that correspond to entry barriers, profit rates, concentration ratios and pricing levels. The persuasive view thus may be indirectly evaluated by checking the consistency of its implications with cross-sectional data. The primary initial efforts of this kind are by Bain (1956) and Comanor and Wilson (1967, 1974).

On the basis of extensive interviews and a questionnaire survey, Bain offers a qualitative assessment of the relative importance of specific entry barriers in a sample of 20 large U.S. manufacturing industries.¹¹ Bain (1956, p. 14) considers four structural forms that an entry barrier may take: absolute cost advantages of established sellers, product differentiation advantages of established sellers, scale economies and capital requirements. From this study, Bain (1956, p. 216) famously concludes that product differentiation is probably the most important entry barrier. Using profit rate data from 1936-40 and 1947-51, Bain (1956, pp. 196, 201) further reports that the average profit rates for dominant firms are significantly greater in high than moderate-to-low concentration industries; in addition, among highly concentrated industries, profit rates are significantly higher for those that are categorized as having very high barriers to entry than for those with lesser entry barriers. Bain thus suggests that concentration and barriers to entry are two of the major determinants of profitability.

Where does advertising fit in? As a general matter, Bain (1956, p. 143) does not conclude that advertising *per se* is the primary source of product differentiation. But drawing on his interviews, questionnaires and estimates of "traceable"

¹¹According to Bain (1956, p.3), a barrier to entry is evaluated "by the advantages of established sellers in an industry over potential entrant sellers, these advantages being reflected in the extent to which established sellers can persistently raise their prices above a competitive level without attracting new firms to enter the industry."

advertising expenditures, Bain (1956, pp. 114-15, 125) clearly argues that an incumbent firm may use advertising to contribute importantly toward a preference for its established products in comparison to new-entrant products. This possibility is of particular significance in consumer-goods industries; in fact, Bain (1956, p. 125) concludes that the “single most important basis of product differentiation in the consumer-good category is apparently advertising.” On the whole, Bain’s pioneering analysis suggests that advertising-induced product differentiation may constitute an important entry barrier that helps established manufacturers (especially in highly concentrated and consumer-goods industries) to set prices above costs and earn considerable profits. His work thus offers early empirical support for the hypothesis that advertising has significant anti-competitive effects.

As Bain acknowledges, his analysis is not conclusive. It is useful here to note two limitations. First, Bain does not explain the process through which advertising leads to a preference for established products and creates an entry barrier. Second, Bain’s empirical analysis relies upon qualitative classifications of industries with respect to market-structure variables.

These limitations motivate Comanor and Wilson (1967, 1974). Echoing the “reputational” reasoning of Braithwaite (1928), they explain that advertising-induced product differentiation can generate an entry barrier, if high prevailing levels of advertising create additional costs for new entrants above those experienced by established firms. In support of this possibility, they emphasize that a new entrant may face greater market-penetration costs than originally did the pioneering firm, since the new entrant must induce consumers to *switch* from an established and familiar product to a new and unknown product. As Comanor and Wilson (1974, pp. 48-49) explain, high prevailing advertising levels then may constitute a barrier to entry, if they “reinforce the experience that consumers have with established products” so as to enhance brand loyalty and exacerbate the differential advertising costs that await new entrants. They stress, too, that a new (small-scale) entrant is at cost disadvantage relative to an established (large-scale) firm, if an advertising scale economy is present.

Comanor and Wilson also respond to the empirical limitations of Bain’s analysis. While Bain creates qualitative industry rankings for hard-to-measure market-structure variables, Comanor and Wilson proxy for these variables with alternative variables for which quantitative data are available. They are thus able to perform multi-variate regression analyses on measurable variables. Seeking to explain profit averaged over the period 1954-57 for manufacturers in 41 consumer-goods industries, they allow for a variety of explanatory variables, including the

advertising/sales ratio, the four-firm concentration ratio and measurements that proxy for demand growth, scale economies and capital requirements. The advertising/sales data are taken at the industry level from IRS statistics and proxy for product differentiation. The rate of profit is measured at the industry level as the after-tax rate of return on shareholder equity. As their main finding, Comanor and Wilson report a positive and significant relationship between the rate of profit and the advertising/sales ratio.

Comanor and Wilson’s finding offers support for the hypothesis that advertising causes profitability. But advertising is in fact an endogenous variable, and it thus inappropriate to treat industry advertising intensity as an independent structural variable. Indeed, if firms re-invest a certain percentage of their profit or sales in advertising, then their finding also may be interpreted in support of the reverse hypothesis that profitability causes advertising. Relatedly, there may be underlying influences (inelastic demand, low marginal cost) that result in larger price-cost profit margins. Influences of this kind may generate both higher profit and larger advertising, since firms have greater incentive to advertise when mark-ups are large. If the corresponding variables are omitted from the regression, then the relationship between advertising and profitability may be spurious.¹²

In response to the endogeneity concern, Comanor and Wilson (1974) extend their analysis to include a profitability equation and a second equation in which the advertising/sales ratio is influenced by profit margins and other variables. They find that advertising intensity continues to affect profitability. They also supply some empirical support for the existence of important advertising scale economies. On the basis of these and other findings, Comanor and Wilson (1974, p. 239) interpret their study as offering “empirical support for the conclusion that the heavy volume of advertising expenditures in some industries serves as an important barrier to new competition in the markets served by these industries.”

Comanor and Wilson’s work marks a significant step forward, but it also has important limitations. First, while their emphasis on the experience-based demand asymmetry between established and new firms is well-placed, they do not endogenize the manner in which advertising interacts with consumers’ experiences, so as to “reinforce” past experiences and differentially reward established firms.

¹²The endogeneity concern is defined and thoroughly explored by Schmalensee (1972). As noted below, Telser (1964, p. 551) offers an early statement of this concern. See also Sherman and Tollison (1971). As I detail in Section 3, similar endogeneity problems arise with regard to the relationships between advertising and sales as well as concentration. The endogeneity concern is also suggested by the optimal advertising literature that derives from the work of Dorfman and Steiner (1954). I discuss this literature in Section 4.1.

Second, profitability may derive less from advertising itself than from the underlying product and market characteristics that determine advertising as well. The endogeneity concern is fundamental and calls for simultaneous-equation methods; however, in an inter-industry study, the identification of any structural equation is difficult, since most right-hand side variables are endogenous. Third, if advertising generates brand loyalty, then measurement concerns arise: while accounting profit treats advertising as a current expense, a true measure of profit would treat advertising as (intangible) capital that depreciates at some rate. Fourth, inter-industry studies leave unexposed important relationships that may be associated with the particular features of the industry, product or advertising media mix. These and other issues motivate much subsequent research, which I describe in the sections that follow.

2.3. The Informative View

Under the informative view, advertising is attractive to firms as a means through which they may convey information to consumers. An important implication of this view is that advertising may have pro-competitive consequences. As noted above, elements of this view appear in the writings of Marshall and Chamberlin. But the informative view really took flight in the 1960s, largely under the leadership of a group of “Chicago School” economists.

The formal foundation for the information view is laid by Ozga (1960) and Stigler (1961). Stigler interprets price dispersion as a reflection of consumer ignorance, where this ignorance in turn derives from the costs to consumers of obtaining information as to the existence, location and prices of products. He then constructs a model of optimal consumer search behavior, in which advertising effectively reduces consumers’ search costs, since it conveys such information. Stigler thus argues that advertising is a valuable source of information for consumers that results in a diminishment in the extent of price dispersion. Ozga develops similar themes, although in his analysis consumers passively receive information (from social contacts and/or advertising) and do not search for it. As well, Ozga (1960, p. 40) goes beyond Chamberlin and offers for informative advertising a new rationale for diminishing returns: “as more and more of the potential buyers become informed of what is advertised, more and more of the advertising effort is wasted, because a greater and greater proportion of people who see the advertisements are already familiar with the object.”

In Telser’s (1964) influential effort, the theoretical and empirical foundations

for the informative view are significantly advanced. Telser's explores the following question: Is advertising compatible with competitive (i.e., price-taking) behavior among firms? Telser (1964, p. 558) concludes with a positive answer: "There is little empirical support for an inverse association between advertising and competition, despite some plausible theorizing to the contrary...Advertising is frequently a means of entry and a sign of competition. This agrees with the view that advertising is an important source of information."

How does Telser arrive at this conclusion? He begins by considering the theoretical compatibility between advertising and competition. Like Chamberlin and Kaldor before him, Telser concludes that this issue cannot be resolved on the basis of theory alone. In reaching this decision, Telser notes that, on the one hand, some kinds of advertising are compatible with, and even essential to, competition. For example, a certain fixed expenditure on advertising may be necessary to inform consumers of a firm's existence before any sales can be made. In the competitive framework, it then can be conceived that price is given to match average costs, inclusive of advertising expenditures (the cost effect). On the other hand, there are two reasons that advertising may be associated with monopoly power. First, in an early statement of the endogeneity concern, Telser (1964, p. 551) observes that "firms that have some monopoly power are more likely to advertise because they can obtain most of the increased sales stimulated by their advertising." Second, Telser (1964, p. 541) allows that some advertising may be persuasive and "create monopoly power that otherwise would not exist."

Given the lack of theoretical resolution, Telser pursues an empirical assessment of the cross-sectional relationship between advertising intensity and other market variables. Methodologically, Telser's analysis is a natural intermediate step between the earlier analysis of Bain and the subsequent analyses of Comanor and Wilson. Telser computes advertising/sales ratios from IRS data and performs simple regression analysis. He offers two kinds of indirect evidence.

First, Telser considers the relationship between advertising and concentration. Recall that Kaldor posits a positive relationship. Telser (1964, p. 542) takes the following perspective: "If advertising fosters monopoly, then concentration and advertising should be positively correlated." For 42 consumer-goods industries, Telser calculates (four-firm) concentration and advertising-sales ratios for three different census years. He then considers a linear regression of concentration on advertising intensity, and he reports a positive but very weak relationship. Telser (1964, p. 544) concludes that "the correlation between concentration and advertising is unimpressive."

Second, Telser examines the relationship between advertising and market-share stability. Telser (1964, p. 547) reasons that if “advertising succeeds in sheltering a firm’s products from competitive inroads, this should be reflected in more stable market shares of the more advertised goods.” To explore this possibility, he considers the market-share and advertising patterns of products in three consumer-goods classes: food, soap and cosmetics. Using various measures, Telser finds that market-share stability appears inversely related to advertising intensity. Telser (1964, p. 550) thus argues that his findings “refute the view that advertising stabilizes market shares.” The apparent implication is that advertising facilitates entry and new-product introductions.

Telser’s analysis countered the then-prevailing persuasive view and offered an empirical legitimacy to the alternative view that advertising is an important source of information that promotes competition. His work also spawned an on-going empirical literature that explores the competitive effects of advertising. In this literature, some important limitations of Telser’s analysis are noted. Most importantly, Comanor and Wilson (1967, 1974) question Telser’s use of concentration as a measure of market power. Like Bain, they contend that profitability is a better measure of market power, and they argue that concentration and entry barriers (such as advertising) are key explanatory variables.

I turn next to a pair of insightful papers by Nelson (1970, 1974b).¹³ He begins with a simple question: How, exactly, does advertising provide information to consumers? The informative content of advertising is clear, when the advertisement contains direct information as to the existence, location, function or price of a product. But what about all of the advertising that does not contain direct information of this kind? Is it persuasive? Nelson argues rather that such advertising still plays an informative role, although the role is indirect. To develop this argument, Nelson (1970) makes a distinction between *search* and *experience goods*. A search good is one whose quality can be determined prior to purchase (but perhaps after costly search), whereas the quality of an experience good can be evaluated only after consumption occurs. Building on this distinction, Nelson (1974b) argues that the indirect information contained in advertising is especially important for experience goods.

Nelson (1974b, pp. 732-4) gives three reasons why advertising may provide indirect information to consumers of experience goods. First, there is a *signaling-efficiency effect*. The demand expansion that advertising induces is most valuable

¹³As I discuss in Section 3, Nelson (1975) offers additional evidence concerning the consequences of advertising. Nelson (1974a, 1978) elaborates on some of the basic insights.

to efficient firms, and these low-cost firms are also inclined to seek demand expansion through other means, such as with lower prices and higher qualities. Thus, by advertising, a firm signals that it is efficient, which implies in turn that it offers good deals.¹⁴ Second, consumers may have heterogeneous tastes, and it may be difficult to efficiently match products and buyers. A seemingly uninformative advertisement can assist in this process, since a firm has the incentive to direct its advertising toward the consumers that value its product the most. This is the *match-products-to-buyers effect*. Third, advertising may remind consumers of their previous experience with the product, and such recollections are of more value to sellers of high-quality goods. Given this *repeat-business effect*, even new consumers may draw a positive association between advertising and quality, and advertising thus may signal quality.¹⁵

What about search goods? Certainly, advertising can provide indirect information here as well. For example, even if a search-good advertisement contains no direct information, the fact that the good is advertised may suggest that the seller is efficient and thus that the good is aggressively priced. Due to the signaling-efficiency effect, therefore, consumers may be encouraged to search for the advertised good. In comparison to experience goods, though, search goods offer greater potential for direct information transmission through advertising. Nelson (1974b, p.734) thus adopts the hypothesis that “advertising for experience qualities is dominantly indirect information and advertising for search qualities is dominantly direct information.”

Nelson (1970, 1974b) presents a variety of empirical evidence in support of this hypothesis. First, he offers evidence that advertising intensity is higher for experience goods. Since there is less direct information that can be relayed in ads for experience goods, this evidence is consistent with the hypothesis that experience-good advertising largely provides indirect information. Second, Nel-

¹⁴The signaling-efficiency effect appears to have been missed by earlier contributors. In fact, Pigou (1924, p. 177) raises the general issue and reasons toward the opposite conclusion: “There is, however, some slight ground for believing that firms of low productive efficiency tend to indulge in advertisement to a greater extent than their productively more efficient rivals. For, clearly, they have greater inducements to expenditure on devices, such as special packages, designed to obviate comparison of the bulk of commodity offered by them and by other producers at a given price.”

¹⁵Nelson (1974b, p.734) summarizes the argument as follows: “Advertising increases the probability of a consumer’s remembering the name of a brand. Those brands with the highest probability of repeat purchase have the greatest payoff to improved consumer memory. In consequence, brands which provide the highest utility have the greatest incentive to advertise.”

son presents evidence that the ratio of TV to magazine advertising is significantly higher for experience goods. This supports his contention that search goods are especially conducive to the transferral of direct information. Third, Nelson reports evidence for experience goods that advertising intensity is higher for non-durable and lower-priced goods. These findings are consistent with the general idea that, for major (durable and high-priced) purchases, a consumer relies on the information of friends and family, whereas for more frequent (non-durable and low-priced) purchases, a consumer relies on advertising as a source of indirect information.¹⁶

Nelson's approach seems to assume that consumers make thoughtful inferences in response to advertising. This is disquieting, since it seems rather that actual consumers often devote little thought to advertising. But as Nelson stresses, his approach in fact does not require that consumers make such careful judgments. If consumers are responsive to advertising, whether thoughtfully or not, then this induces a positive relationship between advertising and consumer utility, since it is then the most-efficient and best-deal firms that gain the most from advertising. Thus, when consumers naively respond to advertising, firm behavior is generated that confirms the initial responsiveness.¹⁷

Nelson's work enriches considerably the informative view of advertising. His work also offers support for the position that the advertising-profitability relationship is spurious, since more efficient firms both earn greater profit and, as Nelson (1974b) argues, advertise more heavily. There are, however, important limitations. First, as Nelson (1974b, p. 749) acknowledges, the empirical distinction between search and experience goods is somewhat arbitrary, and so his empirical findings are not conclusive. Second, Nelson (1974b) reasons that high-quality firms are especially attracted to demand-expanding advertising, but he does not provide a formal model that delivers this prediction. As Schmalensee (1978) emphasizes, if lower-quality goods have lower marginal costs, then it is possible that low-quality firms gain differentially from demand expansion. It is also possible that a high-quality firm might prefer to relay indirect information to consumers through its price choice rather than its advertising outlay. These concerns are featured in subsequent formal research, as I discuss in Section 6.

¹⁶For other early studies in which advertising intensity varies with the nature of the product, see Borden (1942), Doyle (1968a,b), Else (1966) and Telser (1961).

¹⁷As Nelson (1974b, p. 751) puts it: "Many economists have felt that other consumers think quite imprecisely about advertising - and well they might. But this superficial observation has led economists, but not consumers, astray. Economists have failed to see that consumers' response to advertising persists because of the underlying information role of advertising." See also Nelson (1974a, pp. 50-51).

2.4. The Complementary View

Under the complementary view of advertising, consumers possess stable preferences, and advertising directly enters these preferences in a manner that is complementary to the consumption of the advertised product. This view is logically distinct from the persuasive view (wherein advertising changes the utility function) and the informative view (wherein advertising directly affects utility only if it contains information). The complementary view allows that advertising may contain information and influence consumer behavior for that reason. But there are other possibilities as well. For example, the consumer may value “social prestige,” and advertising by a firm may be an input that contributes toward the prestige that is enjoyed when the firm’s product is consumed.

The complementary view is also associated with the Chicago School. Important elements of this view are found in Telser’s (1964) work, but Stigler and Becker (1977) offer a more complete statement of the central principles. Under their approach, consumer utility derives from the consumption of various commodities. These commodities, however, are not sold or purchased on the market; rather, they are produced through a household production technology that uses market goods, advertising and other variables (e. g., time) as inputs. In the simplest representation, a consumer buys a market good in quantity X at some per-unit price P_x , and the market good and its associated advertising expenditures A are then inputs that jointly produce an amount Z of the commodity. The consumption of Z then implies a utility level U for the consumer. For example, if Y represents the level of some composite good, then these relationships might be captured as follows: $U = U(Z, Y)$ and $Z = g(A)X$, where $(U_z, U_y, g(A), g'(A), X, Y) > 0$.

Importantly, this structure implies a complementarity between A and X in the production of Z . As Stigler and Becker (1977, p. 84) put it, when a firm advertises more, its product becomes more attractive to the consumer, since “the household is made to believe - correctly or incorrectly - that it gets a greater output of the commodity from a given input of the advertised product.”¹⁸ Using this approach,

¹⁸Bridging the informative and complementary views, Verma (1980) posits that advertising contains information and thereby enables consumers to produce information at lower cost, so that they can more effectively convert market goods and time into valued commodities. Verma describes specifications for the underlying information and commodity household production functions under which it may be *derived* that advertising exerts a complementary influence on the demand for the advertised product. An implication is that advertising should be highest, when the consumers time cost is high and/or alternative information gathering methods are relatively ineffective. See also Ehrlich and Fisher (1982) and Sauer and Leffler (1990).

Stigler and Becker show that even a perfectly competitive firm may advertise. Intuitively, a price-taking firm may be willing to incur an advertising expense, because the derived demand for its product then shifts up, enabling it to “take” a higher price. An implication is that firms may compete in the same commodity (e.g., prestige) market even though they produce different market goods (e.g., jewelry and fashion) and advertise at different levels.

The welfare implications of the complementary approach are explored by Nichols (1985).¹⁹ Drawing on Lancaster’s (1966) characteristic approach to consumer behavior, Nichols interprets Z as the level at which a characteristic is enjoyed, when the market good is consumed at level X and advertised at level A . Consumer welfare is then given by $U = U(g(A)X, Y)$, where Y is a composite nonadvertised good. For any given A , the consumer chooses X and Y to maximize U subject to the budget constraint $I = P_x X + P_y Y$, where I is income and P_y is the price of good Y . A profit-maximizing monopolist chooses A and P_x , where $P_M(A)$ denotes the monopoly price of X for any given level of advertising. Nichols then considers a slight increase in advertising from the profit-maximizing level. As this change imparts no first-order effect on the monopolist’s profit, social welfare rises if and only if consumer welfare rises. The consumer experiences a direct gain from the increase in A , but there also may be a harmful effect of a higher price (if $P'_M(A) > 0$). I formally analyze a related model in Section 4.2, but one conclusion is already suggested: the consumer gains - and thus a monopolist undersupplies advertising - when an increase in advertising would not cause an increase in price (i. e., when $P'_M(A) \leq 0$).²⁰

A related but distinct analysis is developed by Becker and Murphy (1993). Under their approach, the level of advertising A for a good X enters directly into the utility function: $U = U(A, X, Y)$. Over the relevant range, the marginal utility of advertising may be positive ($U_A > 0$), in which case advertising is a “good,” or it may be negative ($U_A < 0$), so that advertising is a “bad,” but in either event

¹⁹See also Hochman and Luski (1988), who reconsider Nichols’s (1985) analysis of perfectly competitive commodity markets with advertising, and Fisher and McGowan (1979), who propose that the direct effect of advertising on consumer surplus be included when the welfare effects of advertising are considered. Adams and Yellen (1977) take the same position. As discussed further in Section 4.2, the Fisher-McGowan (1979) paper is written in response to a formalization of the persuasive view offered by Dixit and Norman (1978). See also Wernerfelt (1990), who argues that brand advertising creates value for consumers, since it enables them to signal through brand choice their types to one another.

²⁰Observe that this implication is incompatible with Braithwaite’s (1928) (taste-changing) result that monopoly advertising diminishes consumer surplus unless price is strictly reduced.

the marginal utility of the advertised product rises with advertising ($U_{AX} > 0$). Advertising is thus complementary to the advertised product and serves to shift out the demand for this product. The existence of a stable preference function ensures that the normative implications of advertising can be explored, once it is explained how the quantity of advertising consumed is determined.

As Becker and Murphy note, it is often infeasible to separately and directly sell advertising to consumers.²¹ Instead, advertisements may be given away (e.g., direct mail ads are “free” to receive) or sold jointly with the other products (e.g., newspaper/TV ads are sold jointly with newspapers/TV programs). The former case may be understood as a situation in which advertising is a good (or at least not a bad) that is given away, the quantity of advertising is determined by the producers, and each consumer simply accepts (consumes) all of the advertising that is received. This is the conventional modeling approach. The latter case is more novel. It corresponds to a situation in which each consumer determines his consumption quantity of the joint good, given the price of the joint good. As advertising is complementary, it may be sold at a subsidized implicit price. Indeed, if advertising is a bad (e.g., TV ads may lower utility), then its implicit price is negative (advertisers include free and enjoyable programs to compensate the viewer for watching the ads).²² Thus, while Becker and Murphy acknowledge that the advertising market has special properties, they conclude that these properties do not prohibit the assimilation of advertising into consumer choice theory.

The welfare analysis of advertising may now proceed using standard techniques. In line with Nichols’s finding, Becker and Murphy show that a monopolist undersupplies advertising, when advertising is a good and increased advertising does not raise price. The key point is that a monopolist cannot appropriate all of the consumer-surplus benefits that are associated with advertising.

It is interesting to contrast the complementary view with the other views. In response to the anti-competitive interpretation of advertising under the persuasive view, Nelson (1974b) makes the pro-competitive argument that advertising,

²¹Consider a separate market for TV advertisements. If the ads were “goods,” then consumers would pay for them; and if they were “bads,” then consumers would be paid to watch them. Either way, important monitoring problems could arise: it could be difficult to ensure that all watching consumers pay, and that all paid consumers watch. As noted above, the joint-supply nature of advertising is observed also by Kaldor (1950), who concludes that advertising thus may be excessively supplied. By contrast, Telser (1964, 1966) stresses that there may be joint-supply economies, since the transactions (e.g., monitoring) costs associated with a separate advertising market might be considerable. See also Steiner (1966) for a rejoinder.

²²See also Barnett (1966) and Telser (1978).

when properly understood, is informative. Advocates of the complementary view, by contrast, circle back and agree with the persuasive view that advertising often provides little information. Their response is rather that even uninformative advertising can be beneficial, since consumers may value it directly.

The main advantage of the complementary view is that it offers a framework within which to conduct the welfare analysis of seemingly persuasive advertising, without positing that such advertising embodies indirect information. Surprisingly, the apparent implication is that such ads may be undersupplied, at least in monopoly markets. This view also has important limitations. First, the restrictions that are imposed upon the data may be weak, since the specific predictions are often sensitive to assumptions placed upon unobservable household production or utility functions. Second, the assumption that consumers interact with advertising on a voluntary basis may be challenged. Under the complementary approach, a consumer tolerates an ad that is a bad, since the consumer receives compensation through some joint consumption experience. But there are also ads that lower utility and cannot be avoided. For example, a consumer may find an ad on a passing city bus objectionable but unavoidable.²³ This kind of advertising, like pollution, may be excessively supplied. A complete argument in favor of this suggestion, however, must explain why a firm chooses to supply such an ad. One possibility is that the ad is not a bad to all consumers, and “innocent bystanders” may suffer as the ad makes its journey to the intended audience.

2.5. Summary

The discussion above describes the insightful reasoning that led to the formation of each of the three conceptual views of advertising. These views identify the main considerations that govern the impact of advertising on social welfare. Four (not entirely exclusive) considerations are identified:

1. Combative Advertising: As Marshall explains, some advertising is combative, acting to redistribute consumers among brands. If the real differences between brands are modest, then combative advertising may be excessive. Under the informative view (Ozga, Stigler, Telser, Nelson), also acknowledged by Marshall,

²³As Fogg-Meade (1901, pp. 231-2) put it a century ago, “The successful advertisement is obtrusive. It continually forces itself upon the attention. It may be on sign boards, in the street-car, on the page of a magazine, or on a theatre program. Everyone reads it involuntarily, and unconsciously it makes an impression. It is a subtle, persistent, unavoidable presence that creeps into the reader’s inner consciousness.”

advertising is mainly constructive and corresponds to a necessary competitive cost that is associated with the provision of information to consumers.

2. Persuasion and Consumption Distortions: As Braithwaite argues, advertising may change tastes and distort consumption quantities. This results in a loss in consumer surplus relative to the pre-advertising benchmark. Informative-view advocates counter that much advertising is informative, either directly or indirectly, and there is no taste-changing consumption distortion. For a given product, complementary-view advocates (Stigler, Becker, Nichols, Murphy) argue further that the advertising-inclusive demand curve is the relevant benchmark, even for non-informative advertising.

3. Joint Supply: As Kaldor stresses, advertising is often jointly supplied, and so there is no separate market for advertising in which consumers may directly register their willingness to pay. Given that the suppliers of advertising value its complementary effects, the supply of advertising may be excessive. Complementary-view advocates counter that consumers make choices as to bundles that include advertising; furthermore, any social welfare analysis should include the manner in which consumers directly value advertising. Advertising may be undersupplied.

4. Brand Loyalty, Advertising Scale Economies and Market Power: Persuasive-view advocates (Braithwaite, Robinson, Kaldor, Bain, Comanor, Wilson) argue that advertising creates brand loyalty (reputations) and may be subject to increasing returns to scale. Advertising thus results in greater market power for established firms, and market performance suffers: advertising deters entry and leads to higher prices. Informative-view advocates counter that advertising provides price and quality information and facilitates entry. Market performance is enhanced: advertising encourages entry, efficient production, lower prices and higher-quality products.

The key initial writings offer conceptual frameworks with which to identify the main considerations that govern advertising's social value. As well, some initial evidence is presented. At the same time, the arguments have important limitations, as I have noted. There is more to be done. In the remainder of this survey, I describe further progress in the economic analysis of advertising. I begin in the next section, with a description of empirical research that further evaluates the effects of advertising.

3. Empirical Regularities

Beginning in the 1960s and 1970s, as the distinctions between the persuasive and informative views became clear, a huge volume of empirical work emerged that evaluates the predictions of these two views. Much of the initial work follows the lead of Bain (1956) and Comanor and Wilson (1967, 1974) and seeks empirical regularities at the inter-industry level. But many of the earlier efforts also search for regularities using data at the industry, firm or even brand level. As I discuss in the Introduction, in the modern empirical literature, studies are increasingly conducted at such levels. In the present section, I review the initial and (first-group) modern empirical analyses of advertising.

The studies are organized by topic. Each subsection treats a separate topic and then wraps up with a summary of the main conclusions coming from research on that topic. By organizing the section in this way, I hope to provide convenient and self-contained treatments of several topics, while enabling a disinterested reader to simply read the associated summary and then move on to a topic of greater interest. The review is non-technical. I direct the reader to other surveys and books that treat some of these topics in greater detail than is possible here.²⁴

At the outset, it is important to emphasize two of the many obstacles with which an empirical analysis of advertising must contend. First, the relationships between advertising and other variables are beset with endogeneity concerns. Advertising may be associated with higher sales, because firms respond to greater sales with greater advertising; advertising may be associated with inelastic demand, since advertising firms are attracted to markets in which consumers are poorly informed; advertising may be associated with greater profitability, because advertising firms are more efficient or operate in markets with inelastic demands; and so on. Second, fundamental measurement problems may arise. For example, a firm's sales and profit may be influenced by its current advertising and its past advertising (due to "goodwill" effects). The proper treatment of advertising (current expense or intangible capital?) in the measured profit rate then becomes an important consideration.

In light of these and other obstacles, it is natural to question the relevance of the empirical studies reviewed here. These studies, however, play a valuable

²⁴For other reviews of various aspects of the material covered here, see Albion and Farris (1981), Berndt (1991), Comanor and Wilson (1979), Ekelund and Suarman (1988), Hay and Morris (1991), Ornstein (1977), Scherer and Ross (1990), Schmalensee (1972, 1989) and Simon (1970).

role. If one view on advertising is generally true, then the implications of that view should be confirmed in the studies reviewed here. Likewise, if the effects of advertising are rather found to vary across circumstances, then the studies reviewed here may suggest empirical regularities for certain groups of industries or among particular variables. Such findings can guide subsequent theory construction, ultimately leading to more successful empirical efforts that use new data sets and obtain consistent estimates of structural parameters. Finally, several of the studies reviewed here confront the endogeneity of advertising. Some studies attempt to estimate structural parameters using simultaneous-equation methods, while other studies seek exogenous variation in advertising through laboratory or natural experiments.

3.1. The Direct Effects of Advertising

I begin by considering the direct effects of advertising. Evidence is described that concerns the effect of a firm's advertising on its current and future sales, the sales of other firms and the brand loyalty of its consumers. I also discuss evidence as to the presence or absence of advertising scale economies.

3.1.1. Sales

I review here empirical studies of advertising and sales. Two questions are emphasized. First, is there a positive association between current advertising and current and future sales? If a significant association with future sales is detected, this would support a goodwill effect and thus the contention of Braithwaite (1928) that advertising can have long-lasting reputational effects. Second, does advertising influence overall industry demand, or is it more combative, as Marshall (1890, 1919) suggests, tending to redistribute sales within the industry?

By the start of the 1970s, there existed a number of statistical studies that explain sales or market shares with advertising and other variables. As Schmalensee (1972, Chapter 4) details, however, most these studies suffer from serious limitations. With important exceptions, the earlier studies fail to include lagged measures that would permit identification of a goodwill effect and measures that would assess the effect of rival-firm advertising on own sales. In addition, while some early work acknowledges that advertising is endogenous, a simultaneous-equation analysis of advertising and sales did not appear until the late 1960s.²⁵

²⁵Jastram (1955) offers an early discussion of the goodwill effect. Roberts (1947) presents an

The empirical analysis of the advertising-sales relationship takes a step forward with Lambin's (1976) ambitious effort. Lambin uses various sales, quality, price and advertising data for 107 individual brands from 16 product classes and 8 different Western European countries, where the observations are mainly drawn from the 1960-70 period. With these data, he can consider how changes in the advertising outlay for one brand may affect the current sales of that brand and rival brands. As well, he can look over time and evaluate goodwill effects and the rival-brand response that an advertising outlay may induce. Further, Lambin offers estimates based on simultaneous-equation methods and concludes that the risk of simultaneity bias in his sample is limited.

Some of Lambin's findings are as follows. He finds that brand advertising has a significant and positive effect on the brand's current sales and market share. Further, using a distributed-lag model, in which a brand's current sales are explained by current advertising and a constant fraction of previous-period sales, Lambin interprets the lagged-sales coefficient as a measure of advertising's goodwill effect and reports evidence of a goodwill effect for advertising.²⁶ But the quantitative impact of advertising on (current and future) sales is limited: sales appear more responsive to price and product-quality selections. Lambin also reports that a firm's sales and market share are negatively related to rival advertising. Going further, he indicates that advertising reaction elasticities are often positive over time, so that an increase in brand advertising appears to induce rivals to respond with more advertising. In fact, Lambin offers only limited support for the view that advertising increases industry demand, suggesting instead that the competing effects of own and rival advertising on own sales tend to cancel. Lambin's study thus offers some support for the notion that advertising is combative.

These relationships are explored further in other studies. First, a number of

early analysis of the effect of rival advertising on own sales. The reverse-causality possibility between advertising and sales is acknowledged by Borden (1942) and Berreman (1943), but it appears that the first simultaneous-equation analysis is offered by Bass (1969).

²⁶Like other distributed-lag studies described below, Lambin follows Koyck (1954) and posits a constant depreciation rate. The formalization involves two steps. First, specify that a brand's current-period sales (S_t) are determined as a function of current (A_t) and past (A_τ , for $\tau < t$) advertising levels: $S_t = \alpha + \theta \sum_{\tau=0}^t \beta^{t-\tau} A_\tau + \varepsilon_t$. Second, take differences and derive that $S_t = \alpha(1 - \beta) + \beta S_{t-1} + \theta A_t + v_t$, where $v_t \equiv \varepsilon_t - \beta \varepsilon_{t-1}$. The weight on previous-period sales now captures the goodwill effect of advertising. A goodwill effect is present when $\beta > 0$, and $1 - \beta$ is the constant rate of depreciation for past advertising. Notice that this approach assumes that persistence in sales derives only from advertising. As I discuss below, some recent research includes the possibility that firm-specific factors (like product quality) generate sales persistence. See also Berndt (1991) for a discussion of alternative formulations.

studies explore the goodwill effect of advertising. One group of studies posits a distributed-lag relationship between current sales and advertising expenditures and then estimates the rate at which advertising's effect depreciates through time. In influential early studies, Palda (1964), Peles (1971b) and Telser (1962) suggest that the goodwill effect of advertising may be substantial. For certain industries, they report that the firm-level depreciation rates are in the range of 15 to 50% per year.²⁷ Lambin's (1976, p. 96) depreciation-rate estimates for brand advertising vary widely across product groups but take an average of around 50% per year. Likewise, in a study of the cigarette industry, Brown (1978) reports brand-level depreciation rates in the 60% range.

In an important survey, Clarke (1976) considers the various distributed-lag studies and identifies a "data-interval-bias" problem. The use of annual advertising data when the effects of advertising on sales depreciate over a shorter period of time can lead to biased estimates of the depreciation rate. On the basis of studies using data for shorter periods, Clarke (1976, p. 355) concludes that "the duration of cumulative advertising effect on sales is between 3 and 15 months; thus this effect is a short-term (about a year or less) phenomenon." More recently, several studies offer further support for this conclusion. Using various data and specifications for the advertising-sales relationship, Ashley, Granger and Schmalensee (1980), Boyd and Seldon (1990) and Seldon and Doroodian (1989) all offer evidence that the effect of advertising on sales is often largely depreciated within a year (if not less). Leone's (1995) recent survey is of particular interest. He provides a theoretical explanation for the data-interval bias and then presents empirical support for the generalization that on average the effect of advertising on sales is largely depreciated within six to nine months.

When assessing the goodwill impact of advertising, it is important that firm-specific factors not be omitted. As Nelson's (1974b) theory suggests, it may be that advertising affects initial sales but that long-term sales are driven by firm-specific factors, like product quality. Given that higher-quality firms may advertise more, the effects of advertising on future sales may be overstated in an empirical analysis that omits product quality. Using CompuStat data for 417 firms for the years 1982 to 1986, Landes and Rosenfield (1994) show that the distributed-lag approach indeed overstates the durability of advertising when firm-specific dummies are not used to control for omitted firm-specific factors.²⁸ The role

²⁷Other early studies also suggest a low rate of depreciation. Comanor and Wilson (1979), Schmalensee (1972) and Weiss (1969) evaluate a number of the early efforts.

²⁸There is also another group of studies, in which the depreciation rate for advertising is

of brand-specific factors is also stressed by Thomas (1989), who offers a brand-loyalty specification and reports depreciation rates of 80% and above for brands of soft drinks and cigarettes. Likewise, Kwoka (1993) examines the determinants of model sales in the U.S. auto industry, finding that the effect of advertising is short-lived while product styling has a much longer impact.

Second, a number of studies explore the effect of advertising on industry versus firm or brand sales. In an important early study, Borden (1942) makes a distinction between advertising that increases “selective” (i.e., firm/brand) and “primary” (i.e., industry) demands. His case studies of U.S. industries suggest that advertising is often combative, exerting a strong effect on selective demand. He argues that trends in primary demand derive from underlying social and environmental considerations, with advertising serving to reinforce these trends.

The combative nature of advertising is further explored in more recent work. One strand of work emphasizes advertising reactions. In studies of leading brands in certain Australian markets, Metwally (1975, 1976) reports that advertising reaction elasticities are positive over time and detects a substantial cancellation effect. As with Lambin’s study, this work suggests that advertising is often characterized over time by reciprocal cancellation.²⁹ Some additional support for this suggestion emerges from studies that consider the response of incumbent firms to entry. For example, Alemson’s (1970) study of the Australian cigarette industry suggests a reciprocal cancellation effect, whereby new entrants advertise to gain market share and thereby induce increased advertising by incumbents, who seek to maintain market share. Likewise, Thomas (1999) studies the ready-to-eat cereal industry and reports that incumbent firms often respond to entry with advertising, in order to limit the sales of new entrants. Finally, in cross-sectional work, Cubbin and Domberger (1988) examine 42 consumer-goods industries and report evidence that dominant incumbent firms in static (slow-growth) markets often respond to entry with an increase in advertising.

Another strand of studies emphasizes the relationship between industry advertising and sales. These studies suggest that advertising may increase primary

inferred as the rate that best accounts for observed relationships between current advertising expenses and market values. Studies of this general nature are offered by Ayanian (1975, 1983), Bloch (1974) and Hirschey (1982). As Landes and Rosenfield (1994) argue, the market-value studies make strong “steady-state” assumptions and (like distributed-lag studies) overstate the durability of advertising when controls are not used for firm-specific factors.

²⁹See also Telser (1962) and Brown (1978) for descriptions of competitive advertising among U. S. cigarette manufacturers. Related evidence is offered by Kelton and Kelton (1982) for the U. S. brewery industry.

demand in some industries but not others. For example, positive relationships between industry advertising and sales are reported for the U. K. cigarette industry (Cowling, Cable, Kelly and McGuinness (1975)), the U.S. cigarette industry (Seldon and Doroodian (1989)), the U.S. orange market (Nerlove and Waugh (1961)) and the U.S. auto industry (Kwoka (1993)), but other studies report no evidence of a primary demand effect for the U. S. cigarette market (Baltagi and Levin (1986), Hamilton (1972), Schmalensee (1972)) or U. K. instant-coffee market (Cowling, Cable, Kelly and McGuinness (1975)).

In summary, the studies discussed above suggest three main conclusions. First, a firm's current advertising is associated with an increase in its sales, but this effect is usually short lived. Second, advertising is often combative in nature. An increase in advertising by one firm may reduce the sales of rival firms, and rivals may then react with a reciprocal increase in their own advertising efforts. Third, the overall effect of advertising on primary demand is difficult to determine and appears to vary across industries.

3.1.2. Brand Loyalty and Market-Share Stability

According to the persuasive view, the direct effect of advertising is that brand loyalty is created and the demand for the advertised product becomes less elastic. Ideally, a direct empirical assessment of this effect would draw from a longitudinal data set that includes household-level advertising-exposure and brand-purchase data as well as the advertising and pricing behaviors of rival firms. As I discuss in Section 8, with the advent of supermarket scanner data, empirical assessments of this kind have recently appeared. At this point, however, I focus on the earlier empirical investigations of advertising and brand loyalty. These studies pursue two indirect assessments. First, it may be possible to estimate market demand functions for individual brands, in order to see if consumers exhibit more "inertia" in highly advertised markets, or if the estimated price elasticities are lower in magnitude in product groups with high advertising intensity. Second, following Telser (1964), it may be possible to infer the extent of brand loyalty, by further examining the relationship between advertising and market-share stability.

In the first category, Lambin captures brand loyalty with a measure of consumer inertia. For the distributed-lag model, Lambin (1976, pp. 72, 115-18) observes that the lagged-sales coefficient may be generally interpreted as a measure of consumer inertia. He finds significant inertia effects in most markets. Using various measurements of advertising intensity, however, Lambin fails to find a

positive and significant relationship between brand inertia rates and brand advertising intensity. Apparently, consumer inertia is important, but the cause of inertia more likely rests with price and quality than with advertising.³⁰ In a separate approach, Lambin estimates the elasticities of demand for several brands, and he then regresses the absolute value of estimated elasticity alternatively on different measurements of advertising intensity. The regression coefficients are negative, though the statistical significance of the estimates are mostly weak. As Lambin (1976, pp. 138-40) notes, this gives modest support to the position that advertising reduces the elasticity of demand.

In a number of marketing studies from the late 1970s, the effect of advertising on demand elasticity is further examined. As Boulding, Lee and Staelin (1994) explain, however, many of these studies have important limitations. Boulding, Lee and Staelin use longitudinal and cross-section PIMS (Profit Impact of Market Strategies) data, in order to assess at the business-unit level the effect of advertising on demand elasticity. They report evidence that current advertising reduces future demand elasticity for firms that price above the industry average.

The second empirical strategy is to explore the relationship between advertising and market-share stability. A number of studies agree with Telser (1964) that advertising is associated with market-share instability. Support for this conclusion can be found in Ferguson's (1967) study of the liquor industry, Backman's (1967) analysis of consumer non-durable sectors, Alemson's (1970) study of the Australian cigarette industry, and Reekie's (1974) examination of specific U. K. sectors (particularly, foodstuffs and toiletries). In addition, Lambin offers modest empirical support for the proposition that increased advertising intensity destabilizes market shares.

On the other hand, Gort (1963) examines the market shares of the largest firms in U.S. manufacturing sectors in 1947 and 1954, and he reports that market shares are more stable in industries in which product differentiation is greater. Caves and Porter (1978) attempt to reconcile these divergent findings, by distinguishing between advertising's roles as a conduct variable that is associated with non-price competition and the disturbance of market shares and as a structural variable that is associated with product differentiation and the insulation of market shares. Using PIMS data, Caves and Porter (1978, p. 309) report that structural product differentiation (as measured by advertising intensity) exerts a stabilizing influence

³⁰In this context, it is useful to recall the studies by Kwoka (1993), Landes and Rosenfield (1994) and Thomas (1989), which offer evidence in support of the view that brand loyalty is associated more with brand-specific factors (like product quality) than with advertising per se.

on market shares, whereas non-price competition itself (as measured by product R&D) works to destabilize market shares.

Finally, more recent work offers further evidence in support of Telser's (1964) view. In an inter-industry study, Hirschey (1981) considers a large cross-section of U. S. industries over the 1947-72 period and finds that advertising is positively and significantly associated with entry (over 1963-72) and the growth of established nonleading firms (over 1947-63). Similarly, Eckard (1987) looks at the 1963-82 period and finds no evidence that the market-share instability of leading firms is lower in high-advertising industries. In an intra-industry study, Eckard (1991) considers the effect of the 1970 U.S. ban on TV advertising for cigarettes. He finds that brand and firm market shares are more stable in the period after the ban; furthermore, leading-brand shares were declining before the ban and are stable after the ban. Likewise, Sass and Saurman (1995) conduct an intra-industry analysis of the malt beverage market. They report evidence that large national brewers gain market share at the expense of smaller brewers, in states for which (retail) price advertising is restricted.

What conclusions emerge? Given the data limitations, any conclusions must be tentative. That said, it is perhaps most relevant to remark that the studies do not provide strong evidence that advertising consistently increases brand loyalty or stabilizes market shares.

3.1.3. Advertising Scale Economies

I consider here empirical studies that evaluate the possibility of an advertising scale economy. It may be recalled that Kaldor's concentration effect derives from an assumed economy of this kind. Broadly, the empirical studies stress that an advertising scale economy may arise for two reasons: (i). the marginal effectiveness of advertising messages in generating sales may be greater, when the number of messages is already large, and (ii). the advertising expenditure per message (the price per message) may fall as more messages are sent.

Consider first the effectiveness of advertising on sales. As Chamberlin (1933, pp. 133-36) and Ozga (1960, p. 40) suggest, there are conflicting effects. Intuitively, an advertising scale economy may appear (i) if advertising expenditures must pass a threshold level before they command the consumer's attention, or (ii) if, beyond any such threshold level, the marginal benefit to sales of advertising messages is increasing, due to the increased control that the advertised product exercises over the consumer's consciousness. At high levels of advertising, how-

ever, a decreasing return to scale may arise (i) as less responsive consumers are reached, or (ii) as an increasing number of messages must be sent in order to reach a consumer that has not yet been exposed to the advertisement. This intuitive discussion suggests that an advertising scale economy may emerge at low sales volumes (due to the threshold effect), but it does not offer a clear suggestion as to the presence of such an economy at higher sales volumes. A role for empirical study is thus suggested.

Using various (e.g., logarithmic) measures, a number of studies regress sales on advertising and offer evidence that advertising's effectiveness is subject to diminishing returns. In essence, these studies hold other inputs constant and argue that doubled advertising results in less than doubled sales. Simon (1970, p. 21) offers a summary of the advertising studies of this kind. He concludes that "there is not one single piece of strong evidence to support the general belief that increasing returns exist in advertising."³¹ Simon (1970) also presents evidence for direct-mail and clip-out coupon advertising methods that decreasing returns set in even at low sales volumes. Lambin (1976, pp. 95-8) presents further evidence consistent with decreasing returns, as his estimated advertising-sales elasticity coefficients are less than unity. But Lambin's (1976, pp. 127-9) findings also suggest a possible threshold effect, since he finds that small brands keep a higher ratio of advertising share to market share than do large brands.

As Comanor and Wilson (1974, 1979) emphasize, scale economies are normally defined with reference to a proportional increase in *all* inputs. This is potentially important, since economies may be achieved only when advertising is increased in unison with other marketing and production inputs. Under some circumstances, however, the costs of advertising and production are plausibly separable, in which case an important consideration is that advertising in all media be increased in the same proportion. Brown (1978) conducts an interesting study of this kind for the cigarette industry. Using a distributed-lag, simultaneous-equation model of advertising and sales, Brown (1978, p. 433) uses his estimates to calculate the "amount of advertising capital required per unit of sales for any chosen level of sales." The estimated average cost function is decreasing over a large volume of sales, and higher for new brands, suggesting a cost disadvantage for new entrants. Seldon, Jewell and O'Brien (2000) offer a related analysis of the beer industry,

³¹Early advertising studies that find evidence of diminishing returns include Palda (1964), Peles (1971a), Roberts (1947), Shryer (1912), Simon (1969) and Telser (1962). Schmalensee (1972) reviews the early studies. More recent reviews are offered by Albion and Farris (1981), Arndt and Simon (1983), Berndt (1991) and Simon and Arndt (1980).

but their estimates suggest diseconomies of scale.³²

In other recent work, heterogeneity across brands is emphasized. This work also reports evidence of diseconomies of scale in advertising. In a study of 174 brands in 11 categories of small, packaged consumer goods, Boyer and Lancaster (1986, p. 515) find “little support for the proposition that large brands support their market shares with a disproportionately small share of advertising expenditure.” Likewise, Thomas (1989) specifies a brand-loyalty model that allows for heterogenous brand quality. He reports evidence of advertising scale diseconomies in the cigarette and soft drink industries.

Consider now the possibility that advertising scale economies are generated through a reduction in the advertising expenditure per message as more messages are sent. One possibility is that the advertising rate schedule favors large advertisers. In this context, a vigorous debate has emerged with respect to the rates charged by TV networks, particularly in the early 1960s.³³ Blake and Blum (1965) observe that published rate schedules for network television advertising were characterized by significant quantity discounts. In a comprehensive response, Blank (1968) emphasizes the distinction between published price lists and the prices that were actually paid. Over the relevant time period, the cost per minute of advertising varied with cumulative purchases, but it also varied importantly with the program to which the advertisement was joined. Using data for 1965 and 1966, Blank finds that larger advertisers actually paid higher prices per unit of time (i.e., per minute), since they advertised in more popular programs. Furthermore, he notes that price per unit of time is anyhow not the relevant measure: the real issue is whether larger advertisers paid more per “unit of audience.” To operationalize this idea, he considers the cost per thousand homes reached per commercial minute. Blank (1968, p. 28) finds “*no* consistent relationship between cost per thousand and size of the advertiser.”³⁴

³²See also Bresnahan (1984), who reports some evidence in support of advertising scale economies in his study of the beer industry. Seldon, Jewell and O’Brien (2000) explain the differences between their methodology and that used by Bresnahan (1984).

³³This period is of special interest, because of a 1963 decision by the FTC not to allow a merger between Clorox and Procter & Gamble. It was feared that the merger would enable the Clorox brand to enjoy quantity discounts in advertising, which would put it at an advantage relative to other liquid bleaches. Blank (1968) and Peterman (1968) state that the networks ceased to offer quantity discounts in 1966.

³⁴In a subsequent study, Peterman (1968) considers the 1960-63 period and affirms that there is little empirical support for actual discrimination in favor of large advertisers. Comanor and Wilson (1974, pp. 53-61), however, distinguish between discounts associated with the total number of messages purchased from a network and those purchased on specific programs.

A second possibility is that large advertisers are favored in that there are benefits to national versus spot TV advertising. In line with Chamberlin's (1933, p. 134) general discussion, national advertising may be a more effective medium that is available only at high levels of advertising expenditure. Porter (1976a) argues that there is a distinct cost advantage from national (network) TV advertising as compared to achieving the same coverage through local (spot) TV advertising. But Peterman (1979) presents evidence that differences between network and spot rates are far smaller than Porter's (1976a) discussion suggests. In addition, as Scherer and Ross (1990, p. 135) observe, even if network advertising has a cost advantage, there is also an offsetting consideration: network advertising is less flexible than spot advertising, since spot advertising can be better adapted to the conditions of the local market.

Finally, a different approach is to seek indirect evidence of an advertising scale economy, while remaining agnostic as to the reason that this economy exists. In this context, it may be noted that Porter (1976a) offers indirect evidence of a scale economy that is associated with TV advertising. Like Comanor and Wilson (1967, 1974), he considers U. S. industries that manufacture consumer goods, and he regresses industry profits on advertising measures and other variables. When he replaces industry advertising intensity with industry TV advertising intensity, he discovers an increase in the size and significance of the coefficient on advertising.³⁵ Similar indirect evidence is offered by Mueller and Rogers (1980, 1984), who find an important role for TV advertising in explaining increases in concentration for U. S. consumer-goods industries. On the other hand, Lynk (1981) offers evidence that TV advertising is associated with reductions in concentration. These studies are discussed in greater detail below.

What tentative conclusions are suggested? On the whole, the studies that evaluate the effectiveness of advertising suggest that advertising often entails diminishing returns beyond a threshold level, where the threshold level varies across circumstances and may be small. Turning to the studies that evaluate the TV advertising rate schedule, the evidence appears to suggest that any historic dis-

They report evidence that supports the presence of discounts within programs. But Peterman and Carney (1978) re-examine the estimates once more, and they conclude that the estimated discounts are much smaller than those reported by Comanor and Wilson (1974). Further support for Blank's (1968) conclusions is offered by Schmalensee (1972) and Riesz (1973). The latter study finds that the extent to which firms concentrate their advertising expenditures among the networks is generally stable across firms of differing sizes.

³⁵Related findings, using different measures of profitability, are provided by Hirschey (1978, 1982) and Connor and Peterson (1992).

crimination in favor of large advertisers is small. There is, however, some indirect evidence of a scale economy that is associated with TV advertising.

3.2. The Indirect Effects of Advertising

I consider now the indirect effects of advertising on market outcomes. Specifically, I examine the associations between advertising and concentration, profit, entry, prices and quality.

3.2.1. Concentration

According to Kaldor, advertising scale economies exist and big firms are better able to finance large advertising expenditures; as a consequence, advertising promotes greater concentration and leads to an oligopolistic structure. I discuss above the studies that examine the existence of scale economies in advertising. Here, I consider further empirical analyses of the association between advertising and concentration.

The first empirical examination of the advertising-concentration relationship was offered by Kaldor and Silverman (1948). For 118 English industries in 1938, they measure (advertising) concentration by the number of firms needed to account for 80% of industry advertising, and they then calculate the mean advertising intensity for each concentration category. Kaldor and Silverman find that advertising intensity is highest in the eight-firm concentration category, with the advertising intensity declining substantially when the concentration measure exceeds 9 firms or falls below 4 firms. Advertising intensity thus is related to this measure of concentration in an inverted-U fashion. Evidently, large-scale advertising is associated with oligopolistic industries.³⁶

The next set of work explored the possibility of a linear relationship from advertising intensity to concentration, using inter-industry data, regression analysis and standard (e.g., four-firm) measures of concentration. As discussed in Section 2.3, Telser (1964) offered the first test of this kind. For 42 three-digit consumer-product groups, he finds that the relationship is weak and unimpressive. No significant relationship is also observed by Comanor and Wilson (1974), Guth (1971), Lambin (1976) and Schnabel (1970), while Ornstein and Lustgarten (1978) report a significant but weak positive relationship in the 1960s (but none in

³⁶See Schnabel (1970) for a re-examination of the Kaldor-Silverman data. Else (1966) and Doyle (1968b) also use U. K. data to relate (advertising) concentration to advertising intensity.

the 1940s). Examining Telser's (1964) data, Nelson (1975) likewise finds no significant correlation between advertising intensity and concentration for nondurable experience goods and durable goods; however, he reports a significant correlation between advertising intensity and concentration for search goods.³⁷

A related set of studies explores a linear relationship from advertising intensity to concentration, using data for a given industry that varies across different markets (brands, regions, etc.). For example, Vernon (1971) examines 18 therapeutic product classes in the U.S. ethical pharmaceutical industry. In a multi-variate analysis, he finds no evidence that high promotion results in high concentration; indeed, he suggests that high promotion may be associated with less concentration (and thus, perhaps, greater entry). Likewise, Edwards (1973) regresses concentration on advertising intensity for 36 large banks from 23 distinct metropolitan areas, where concentration is measured by the ratio of deposits of the three largest banks in the area to the total deposits in the area. A multi-variate analysis again reveals no significant relationship between advertising intensity and concentration. Finally, utilizing cross-state variation in the legal restrictions on beer advertising, Sass and Saurman (1995) report evidence that (retail) price advertising reduces state-level concentration for brewers.

Some studies use inter-industry data over different time periods to consider advertising as a determinant of changes in concentration. Various studies report evidence that post-war U. S. concentration levels have increased over time in industries that manufacture consumer goods and that the rate of increase is positively associated with advertising intensity.³⁸ For example, Mueller and Hamm (1974) look at 166 U. S. industries over the period 1947-70. For consumer-goods industries, they report a significant positive relationship between advertising intensity and changes in four-firm concentration, when the advertising-intensity dummy variable is medium or high. In comprehensive efforts that use a continuous measure of advertising intensity and differentiate between alternative types of media advertising, Mueller and Rogers (1980, 1984) offer multiple-regression analyses and report a large and significant role for TV advertising in explaining changes in four-firm concentration ratios for U.S. manufacturers in consumer-goods industries between 1947 and 1977. From this evidence, it appears that the emergence of TV advertising in the 1950s created a structural disequilibrium that resolved over time with a growth in concentration levels for consumer-goods industries.

³⁷Other influential studies include Mann, Henning and Meehan (1967) and Telser (1969b). See Ornstein (1977) for a survey of early empirical investigations of advertising and concentration.

³⁸See Ornstein (1977) for a survey of early empirical studies of this kind.

Going further, this evidence might be interpreted as support for the persuasive view that (TV) advertising confers market power. But this interpretation may not be valid. First, the empirical relationship may be challenged. Lynk (1981) observes that the level of concentration tended to fall for those U.S. industries that most increased the fraction of advertising in TV. Lynk's interpretation is that an exogenous reduction in the cost of transmitting information (i.e., the emergence of TV) promotes entry and reduces concentration, much as informative-view advocates suggest. Likewise, in his time-series analysis of the 1970 U.S. TV ban on cigarette advertising, Eckard (1991) reports that industry concentration was declining prior to the ban and that this trend reversed after the ban. Second, even if it is accepted that TV advertising is positively associated with concentration, this does not imply that TV advertising is associated with greater market power. TV advertising may facilitate the entry of more efficient firms or the realization of scale economies in production, distribution or advertising. Complementing the Mueller-Rogers (1980, 1984) data set with additional industry price and output data between 1963 and 1977, Eckard (1987) finds that prices grew more slowly and output grew more quickly in industries that used TV advertising.

Beginning in the 1970s, economists emphasized that the causality between advertising and concentration might run both ways, with concentration also influencing advertising. This suggests a more complex, non-linear relationship, such as the quadratic, inverted-U pattern reported by Kaldor and Silverman. Significant non-linear relationships are reported in many studies (Cable (1972), Cowling, Kelley, McGuinness and Cable (1975), Greer (1971, 1973), Martin (1979a,b), Sutton (1974), Strickland and Weiss (1976), Weiss, Pascoe and Martin (1983)). But other studies offer little support for a quadratic relationship (Brush (1976), Mann, Henning and Meehan (1973), Ornstein (1977), Ornstein and Lustgarten (1978)), present mixed findings (Rees (1975)) or provide little evidence of a positive relationship (Reekie (1975)). More recent work, however, emphasizes industries in which a large share of sales go to final consumers and offers evidence of a quadratic, inverted-U pattern. Buxton, Davies and Lyons (1984) distinguish between 51 U.K. (3-digit) manufacturing industries on the basis of the proportion of sales that go to final consumers. With advertising intensity as the dependent variable, they find a significant quadratic relationship between advertising intensity and concentration, especially for industries of less-than-average concentration and with a greater proportion of sales to final consumers. Likewise, Uri (1987) considers 301 U.S. (4-digit) industries and reports evidence of an inverted-U pattern for industries with a high share of sales to final consumers.

The interpretation of an inverted-U relationship is not clear. Greer (1971) suggests one perspective: in less concentrated markets, competitive escalations in advertising may induce greater concentration, much as Kaldor originally argued; whereas, in highly concentrated markets, collusion among firms and decreasing returns to scale in advertising may limit combative advertising. Rivalrous advertising may thus be most acute in oligopolistic markets. Building on themes suggested by Demsetz (1973, 1974), Nelson (1974b, 1975) and Telser (1964), however, an alternative interpretation also might be advanced: advertising is an instrument of competition, used with particular vigor by low-cost firms in oligopolistic markets, that enhances concentration by directing sales to the most efficient firms.

In summary, the relationship between advertising and concentration is complex. As Telser (1964) initially argued, the hypothesis of a linear and positive relationship between advertising and concentration receives little support. Some support does emerge, however, for an inverted-U relationship, especially in industries that direct sales largely to final consumers. Some support also can be found for an association between the emergence of TV advertising and the subsequent increase in concentration rates for industries that manufacture consumer goods. The appropriate interpretation of these relationships, however, is not clear.³⁹

3.2.2. Profit

Under the persuasive view, advertising creates brand loyalty and works to deter entry. As Bain (1956) and Comanor and Wilson (1967, 1974) argue, this conclusion may be indirectly evaluated by examining the inter-industry association between advertising intensity and profitability. I consider here further work that evaluates the effects of advertising on profits.

The main finding of Comanor and Wilson (1967, 1974) is that a strong and positive relationship exists between advertising intensity and profitability (measured under accounting procedures as the after-tax rate of return on equity) for U. S. manufacturing industries that produce consumer goods. As Comanor and Wilson (1967, 1974) demonstrate, this finding emerges in multi-variate regressions when single- or multiple-regression techniques are used. And related results arise also in other studies, using Canadian, Japanese, U. S. and U. K. data.⁴⁰ Arguably,

³⁹As I discuss in Section 9, recent work by Sutton (1991) draws on the intervening game-theoretic models and offers an interpretation of the relationship between advertising, concentration and market size.

⁴⁰The related literature is vast, and I provide here only a sample. Supportive studies using U.S. data include those by Backman (1967), Boyer (1974), Connolly and Hirschey (1984), Connor

this finding may be accepted as a “stylized fact.” I consider here two further questions. First, does the relationship between advertising intensity and profit vary with the nature of the industry? Second, are there measurement and/or endogeneity concerns that confound the interpretation of this finding as evidence that advertising deters entry?

Consider first the nature of the industry. As Telser (1964) observes, in industries that manufacture producer goods, advertising may play a less central role in the selling costs of the firm. Selling costs may reflect more the expenses that are associated with salesmen and so on. Some empirical support for a diminished role of advertising for manufacturers of producer goods is offered by Weiss, Pascoe and Martin (1983). It therefore might be expected that the relationship between advertising intensity and profitability would be weaker in producer-goods industries. Domowitz, Hubbard and Petersen (1986a, 1986b) provide evidence that is consistent with this expectation. They find that the positive relationship between advertising intensity and profitability is weakened in manufacturing industries that supply producer goods.⁴¹

The nature of the industry may be important, even among industries that manufacture consumer goods. Following Copeland (1923) and Chamberlin (1933, Chapter VI), Porter (1974, 1976b) draws a distinction between *convenience* and *non-convenience goods*. Convenience goods are low-priced, frequently purchased consumer goods, such as soft drinks, toothpaste and soap, that are widely available at retail outlets. By contrast, non-convenience goods are high-priced, infrequently purchased consumer goods, such as furniture, televisions, and motor vehicles, that are available at more specialized retail outlets. For the consumer, the purchase of

and Peterson (1992), Domowitz, Hubbard and Peterson (1986a, 1986b), Esposito and Esposito (1971), Gomes (1986), Hirschey (1978, 1985), Jones, Laudadio and Percy (1977), Kwoka and Ravenscraft (1986), Mann (1966), Martin (1979a,b), Miller (1969), Porter (1974, 1976a, 1976b, 1979), Ravenscraft (1983), Vernon and Nourse (1973) and Weiss (1974). Likewise, Cowling, Cable, Kelly and McGuinness (1975), Geroski (1982), Khalilazadeh-Shirazi (1974) and Nickell and Metcalf (1978) use U. K. data and report evidence of a positive relationship between advertising and profitability. Similar findings are reported by Jones, Laudadio and Percy (1973, 1977) and Orr (1974b) for Canadian data and by Caves and Uekusa (1976) and Nakao (1979) for Japanese data. There are also some dissenting studies. For example, Salinger (1984) finds that advertising interacted with concentration fails to exert a significant and positive influence on profitability measures; Eckard (1991) reports that cigarette-industry profit margins increased after the 1970 U.S. ban on TV advertising; and Landes and Rosenfield (1994) offer evidence that the relationship may reflect the omission of firm-specific variables (like product quality).

⁴¹For further discussion, see Esposito and Esposito (1971), Jones, Laudadio and Percy (1977) and Miller (1969).

a convenience good is a relatively unimportant event, and brand choice may be made on the basis of vague information that is available at low cost. Manufacturer brand advertising may then influence the consumer and thereby represent a key source of product differentiation. By contrast, for non-convenience goods, the consumer's purchase decision is more important. The consumer is then willing to incur meaningful search costs in order to obtain better information. Consequently, competing brands may be differentiated on the basis of point-of-service information provided by sales personnel at retail outlets. In short, consumer choice may be more responsive to advertising by manufacturers of convenience than non-convenience goods.⁴²

An important implication is that the role of manufacturer advertising in shaping the bilateral power relationship between manufacturers and retailers may vary with the type of good.⁴³ A convenience-good outlet is pressured by its consumers to carry heavily advertised goods, and the manufacturer of a convenience good thus may advertise over the head of retailers to reach final consumers and thereby improve its bargaining position with retailers. On the other hand, for non-convenience goods, retailers are in a powerful position, as a retailer can always stock and push alternative brands. The manufacturer of a non-convenience good is thus less able to use advertising to improve its terms of trade with retailers.

As Porter (1974, p. 425) puts it, the broad point here is that "advertising is a more powerful influence on the rate of return for products sold through convenience outlets than for those sold through non-convenience outlets due to the differential importance of advertising on consumer choice and on the rate-of-return bargain between manufacturer and retailer." To test this hypothesis, Porter (1974, 1976b) follows Comanor and Wilson (1967) and considers 42 U. S. consumer-goods industries, which he then subdivides into convenience and non-convenience industries. The empirical findings support Porter's (1974) hypothesis. For the convenience-good category, advertising intensity emerges as a

⁴²Similar themes are advanced by Doyle (1968a,b). As I describe in Section 2, Nelson (1970, 1974b) offers the related finding that advertising intensity tends to be higher for frequently purchased, lower-priced and non-durable goods. He interprets advertising as representing a source of indirect information. See also Ehrlich and Fisher (1982) and Verma (1980), who emphasize that advertising provides information that reduces time costs. Advertising intensity then may be lower in market settings for which other forms of information transmission (e.g., personal selling) are more efficient. Laband (1986) offers evidence that supports this conclusion. See also Sauer and Leffler (1990).

⁴³For related points in earlier work, see Kaldor (1950) and the references cited in footnote 10. See also the discussion in the next subsection of Steiner's (1973, 1978, 1984, 1993) work.

powerful and significant determinant of profitability. The role of advertising in explaining profitability is substantially diminished for non-convenience goods.

A further distinction can be made between industries that manufacture consumer goods and the retail and service industries that deal directly with the public. Advertising by retailers is expected to have greater information content, whereas advertising by manufacturers may reflect a greater persuasive orientation. This distinction is embraced by Boyer (1974), who examines the impact of advertising intensity on profitability for 41 consumer-goods manufacturers and also for consumer retail and service sectors. He finds that the association between advertising intensity and profitability is again strong and positive for consumer-goods manufacturing industries. But his novel finding is that there is a weak and negative association between advertising and profitability in retailing and service industries. Boyer interprets this finding as indicating that retailers, who often advertise in print media as opposed to TV, provide informative advertisements that lead to lower prices.⁴⁴

I consider next the interpretation of the positive relationship between advertising and profitability. A first issue is whether this relationship reflects a measurement problem in the treatment of profit rates. The empirical studies of this relationship commonly measure the rate of profit as reported after tax profit divided by net worth (assets or equity), where both the numerator and denominator are measured according to accounting procedures under which advertising outlays are treated as current expenses. But this “accounting profit rate” may be a biased measure of the “true profit rate,” if advertising has a goodwill effect. This is because advertising expenditures are then in truth investments that generate “intangible capital.” The accounting profit rate may be biased in either direction, since it may understate the numerator (the firm’s advertising outlay may exceed the true current depreciation in its advertising capital) and the denominator (the firm’s stock of advertising capital should be included in its total asset value).⁴⁵

⁴⁴This is also consistent with Nelson’s (1975) finding that the relationship between advertising and profitability is negative for search goods, though the relationship is not significant.

⁴⁵Following Telser (1969) and Demstet (1979), it may be shown that the accounting profit rate overstates the true profit rate if the accounting profit rate exceeds the growth rate of advertising capital. To see this, let π/E (π^*/E^*) denote the accounting (true) profit on equity. Then $\pi/E \equiv [R - VC - a - d_k K]/K$ and $\pi^*/E^* \equiv [R - VC - d_a A - d_k K]/[A + K]$, where $R - VC$ is revenue less variable costs, a is current advertising outlay, K is tangible capital which depreciates at rate d_k , and A is advertising capital which depreciates at rate d_a . The bias is then characterized as $\pi/E - \pi^*/E^* = [\pi/E - A'/A][A/(A + K)]$, where $A' \equiv a - d_a A$ is the net advertising investment.

This raises the possibility that the positive advertising-profitability relationship is spurious, being derived from a measurement approach that biases the profit rate upward in the presence of heavy advertising. This possibility was first noted by Backman (1967), Telser (1968, 1969a) and Weiss (1969).

The two profit rates differ only in the presence of a goodwill effect. An investigation of this bias thus requires some estimate of the depreciation rate for advertising capital. Weiss (1969) concludes that the relationship between advertising intensity and profit rates remains positive, as in the original Comanor-Wilson (1967) regressions, when the profit rate is recomputed under the assumption that advertising has a durable effect that depreciates at a rate of 33% per year. Comanor and Wilson (1974) confirm this conclusion, after using higher depreciation rates derived from their industry demand estimates. On the other hand, using an advertising depreciation rate of 5% rate per year for all firms, Bloch (1974) argues that advertising does not have a statistically significant effect on the true rate of profit; and Ayanian (1975) reports a similar finding, using somewhat higher depreciation rates that vary across industries.⁴⁶ Yet, as I discuss in Section 3.1.1, more recent studies suggest that the depreciation rate is often quite high. This suggests that any bias may be small in magnitude.

A second interpretative issue is whether the advertising-profitability relationship reflects the fact that advertising and profitability are jointly determined. As Schmalensee (1972, 1976a, 1989) emphasizes, advertising intensity and profitability may be positively associated, because they are endogenous and positively related to omitted variables that induce large mark ups. In particular, and in line with arguments by Demsetz (1973, 1974) and Nelson (1974b, 1975), firms of superior efficiency may advertise more and earn more. Following this line of reasoning, it may be possible to disentangle the causal possibilities somewhat by looking at how the relationship between advertising and profitability varies within an industry between large and small firms. If advertising deters entry, then small and large firms may both benefit from this “shared asset,” in which case a positive advertising-profitability association for all firms may be expected. But, if advertising facilitates the entry of efficient, and thus large, firms, then the advertising-profitability association may be much stronger for large firms. Gomes (1986), Kwoka and Ravenscraft (1986) and Porter (1979) provide inter-industry evidence that the advertising-profitability association indeed is significantly greater for large firms. This finding offers some support for the informative

⁴⁶Further studies include Ayanian (1983), Comanor and Wilson (1979), Demsetz (1979), Grabowski and Mueller (1978), Hirschey (1982), Landes and Rosenfield (1994) and Nakao (1979).

view. It is also possible, however, that persuasive advertising insulates large, pioneering firms from competitive incursions, even though recent entrants would be more efficient yet were they to operate at large scale.

Clearly, the endogeneity concern is formidable. Furthermore, simultaneous-equation methods are unlikely to fully resolve this concern. As Schmalensee (1989) explains, in the long run essentially all conduct and structure variables are endogenous; as a consequence, there may be a shortage of exogenous variables that can be used as valid instruments.⁴⁷

In summary, there is evidence that advertising intensity is positively associated with (accounting) profitability for manufacturers of consumer goods. Within the consumer-goods category, this association is strongest for convenience goods. The advertising-profitability association is weaker for producer goods, and the association appears negative for retail and service sectors. These patterns admit plausible economic interpretations. But it is difficult to draw general inferences as to the association between advertising and entry, due to measurement and endogeneity concerns.

3.2.3. Entry

It is also possible to examine the entry-deterrence effect of advertising by exploring the direct relationship between advertising and entry. I consider empirical research of this kind next.

One group of studies suggests that advertising indeed deters entry. For example, Orr (1974a) obtains data on entry for 71 Canadian manufacturing industries in each year from 1963 to 1967, where entry is measured by the increase in the number of corporations in the industry. Orr then regresses entry on a number of variables, and he finds that advertising intensity exerts a significant and negative influence on entry in consumer-goods but not producer-goods manufacturing industries. Related findings are also offered by Duetsch (1975), Gorecki (1976), Harris (1976), Masson and Shannon (1982), Schwalbach (1987) and Shapiro and Khemani (1987). In the market for physician services, Rizzo and Zeckhauser (1990) find that the potential returns from advertising are greatest for experienced physicians, which suggests that advertising may inhibit entry in this industry.

A second group of studies, however, suggests that advertising may facilitate entry. Alemson (1970), Ferguson (1967), Hirschey (1981), McDonald (1986) and

⁴⁷Studies that use simultaneous-equation methods include Comanor and Wilson (1974), Conolly and Hirschey (1984), Geroski (1982), Martin (1979a,b) and Strickland and Weiss (1976).

Telser (1962) report evidence that is consistent with the view that advertising facilitates entry and new-product innovations. Backman (1967), Eckard (1991), Farris and Buzzell (1979), Lambin (1976) and Leffler (1981) also report evidence for various industries and product classes that advertising intensity is positively correlated with new-product innovations. Porter (1978) observes further that a firm's use of network TV advertising is strongly and positively associated with its rate of new introductions to the product line and its overall sales volume.⁴⁸ Finally, in an inter-industry study, Kessides (1986) seeks to explain net entry in 266 U. S. manufacturing industries between 1972 and 1977. He concludes that, in most industries, advertising facilitates entry.⁴⁹

Questionnaire studies offer further insight. In a survey of nearly 300 U.S. product managers in a variety of product groups, Smiley (1988) and Bunch and Smiley (1992) consider the strategies that are most commonly used by firms that seek to deter entry. They find that the creation of product loyalty through advertising is one of the most frequently used entry-deterrence strategies. Limit pricing and capacity expansion, for example, are less popular. In a related study of U.K. product/brand managers, Singh, Utton and Waterson (1998) report that a modest fraction of managers regard advertising as an important variable with which to slow down or dissuade new rival products. In their study, advertising appears most important as a means for launching new products. Together, these studies suggest two lessons. First, advertising is an important strategic variable. Second, managers both use advertising to deter (or restrain) the entry of new products by rivals and to promote the entry of their own new products.⁵⁰

The U. S. pharmaceutical industry is an especially well-suited industry in

⁴⁸The interpretation of a positive relationship between new-product innovations and advertising is not straightforward: such innovations might reflect entry (a new product from a new firm) or entry deterrence (product proliferation by an established firm). Henning and Mann (1978) offer evidence in support of the latter interpretation. Clearly, though, advertising can complement innovation, if it enables firms to establish trademarks and develop reputations. See Shaw (1912) for an early statement.

⁴⁹See also Highfield and Smiley (1987). They report no significant relationship between advertising intensity and new firm creation for four-digit U.S. industries over the 1976-81 period.

⁵⁰The association between advertising and entry also may be gauged by examining the manner in which incumbent firms adjust advertising following entry. As observed in Section 3.1.1, Alemson (1970), Cubbin and Domberger (1988) and Thomas (1999) describe situations in which incumbents respond to entry with advertising. Further studies of this behavior are reported in Section 8. But it is also often true that entry meets with little incumbent response. See Bunch and Smiley (1988), Geroski (1995), Grabowski and Vernon (1992), Leffler (1981), Robinson (1988), Singh, Utton and Waterson (1998) and Smiley (1988).

which to search for an entry-deterrence effect of advertising. In this industry, an incumbent firm enjoys a long period of monopoly power followed by a specific patent-expiration date after which generic-firm entry is possible. The data thus may be divided into “pre-entry” and “post-entry” periods, and it is possible to explore the effect of incumbent pre-entry advertising on entry. As Scott Morton (2000) explains, many studies treat incumbent pre-entry advertising as exogenous to the entry decision.⁵¹ Under this hypothesis, and for a sample of 98 drugs that lost patent protection between 1986 and 1992, she finds that advertising may exert a very slight effect on generic entry, where the sign of the effect depends on the type of advertising. The exogeneity hypothesis, however, is suspect: incumbent pre-entry advertising and entry both depend on unobserved expectations as to the profitability of the post-entry market. Scott Morton thus instruments for incumbent pre-entry advertising in an equation that explains generic entry. The coefficient on advertising is then insignificantly different from zero. Scott Morton (2000, p. 1103) concludes “that brand advertising is not a barrier to entry in the US pharmaceutical industry.”

In total, the direct evidence of the association between advertising and entry is somewhat mixed. Advertising may be used to raise the cost of entry, but it also may be the means of effective entry. The appropriate interpretation of the advertising-entry relationship is subtle and seems to vary across industries.

3.2.4. Price

As Chamberlin (1933) explains, advertising has conflicting effects on price, and the overall relationship cannot be deduced on theoretical grounds alone. I review next the empirical research that addresses the advertising-price relationship.

Consider first the impact of manufacturer advertising on the retail price. A variety of evidence suggests that heavily advertised brands are more expensive for final consumers than are less-advertised goods within the same product class. See, for example, Borden (1942), Backman (1967, p. 125), Nickell and Metcalf (1978), Scherer and Ross (1990, pp. 581-92), Telser (1964, p. 542) and Tremblay and Tremblay (1995). This evidence is consistent with the persuasive view. But, as information- and complementary-view advocates might argue, it is also possible that heavily advertised goods have higher prices, because they have higher (or less variable) quality or embody prestige effects that consumers directly value. Moreover, even if the *relative* prices of advertised products are higher, there remains

⁵¹See Grabowski and Vernon (1992), Hurwitz and Caves (1988) and Leffler (1981).

the question of whether on average *absolute* prices are higher when advertising is present than when it is not. This is a difficult question, to which I now turn.⁵²

In a series of papers, Steiner (1973, 1978, 1984, 1993) considers the relationship between manufacturer advertising and retailer margins and prices. Like Kaldor, Steiner argues that manufacturer advertising shifts power to the manufacturer.⁵³ Retail margins may fall for two reasons. First, when a brand is heavily advertised, retailers are more attracted to a reduced retail price for the brand. Intuitively, a heavily advertised brand is “identifiable” and serves as a benchmark by which consumers may compare prices across retailers; thus, a retailer’s reputation for low pricing is particularly sensitive to the price that it sets for the advertised brand. Extending this argument, a retailer may regard a heavily advertised brand as an especially attractive candidate for “specials” and loss-leader promotions. Second, when a brand is heavily advertised and thus of particular value to retailers, the manufacturer may be tempted to raise the wholesale price. For these reasons, a negative relationship between manufacturer advertising and retail margins is implied.⁵⁴ The overall effect of manufacturer advertising on the final retail price is less clear and depends on the extent to which the manufacturer raises its wholesale price. Retailers set a lower retail price on the advertised brand, *if* any increase in the wholesale price is small.

In support of this argument, Steiner (1973) considers the toy industry and reports evidence that the emergence of large-scale TV advertising in the late 1950s precipitated a substantial drop in retail margins. In cross-sectional work, Albion (1983), Reekie (1979), Farris and Albion (1987) and Nelson (1978) offer evidence that manufacturers’ advertising and retailer margins are inversely related, while Steiner (1993) provides anecdotal support of this relationship in particular industries. In a related study, Nelson, Siegfried and Howell (1992) consider the relationship between market share and the wholesale price for the Maxwell House coffee brand in different regions. They find that the wholesale price is higher in regions for which market share is higher. In their suggested interpretation, well-known brands are attractive to retailers as items on which to run specials, since such brands are used as benchmarks for cross-store price comparisons, and

⁵²For other approaches to this question, see Eckard (1987), Gallet (1999) and Leahy (1991). They provide evidence that manufacturer advertising may be associated with lower prices.

⁵³Similar arguments appear also in earlier work, as observed in footnote 10. Albion and Farris (1981) and Farris and Albion (1980) discuss some of Steiner’s arguments in further detail.

⁵⁴Marshall (1919, pp. 301-02) also argues that branded goods are often used as “leaders” and that wholesale prices are often high.

manufacturers of such brands are thus able to charge higher wholesale prices.⁵⁵

Manufacturer advertising also may impact retail pricing by influencing the scale and function of retail firms. This argument builds from the observation that manufacturer brand advertising and point-of-sale retail service are substitute sources of pre-purchase information for consumers. Brand advertising provides consumers with an implicit quality guarantee, due to the reputational capital that the brand embodies, and a retailer provides a similar implicit guarantee when it elects to carry a brand. In addition, retailer service can improve consumers' information with regard to specific product features. Suppose now that some underlying change were to occur that occasioned a substantial increase in manufacturer brand advertising. Time-constrained consumers might then demand less information from retailers, and retail competition could then focus more on price and less on service. Discount chains carrying brand goods might emerge.

Evidence of this pattern is reported in some industries. In particular, Steiner (1978) argues that this pattern describes the U.S. toy industry, and Pashigian and Bowen (1994) report supportive evidence from the mid-1970s for the U.S. apparel and toy industries. But what is the underlying change? As Steiner (1978) argues, one possibility is that the emergence of TV advertising in the 1950s lowered the cost to manufacturers of providing brand information.⁵⁶ Pashigian and Bowen propose a second possibility: the growth in (relative) earnings by females in the mid-1970s implied an increase cost to shopping time, this instigated a growth in branding, and brand advertising eventually substituted for retail service. Under both interpretations, greater manufacturer advertising is associated with the emergence of large-scale retailers that offer modest service and low prices.

Consider second the impact of retail advertising on the retail price. The classic study on this topic is offered by Benham (1972). In the 1960s, considerable variation existed across states in the U.S. with respect to the legal treatment of advertising in the eyeglass industry. Broadly, states fell into three groups: some states prohibited all advertising, some states prohibited price advertising but allowed non-price advertising, and some states had no restrictions. This variation provides a natural experiment with which to assess the effect of retail advertising on retail pricing. Benham reports that eyeglass prices were substantially higher

⁵⁵Some related themes emerge in a recent study by Chevalier, Kashyap and Rossi (2000). Using scanner data from a large supermarket chain, they find that retail prices and margins tend to be lower for an item over periods for which the item is in peak demand (e.g., tuna at Lent). This is also the time at which the item is more likely to be advertised by the retailer.

⁵⁶See also Bresnahan (1984).

in states that prohibited all advertising than in states that had no restrictions; furthermore, prices were only slightly higher in states that allowed only non-price advertising than in states with no restrictions. The association between price advertising and lower prices is striking and directly supports the informative view. The association between non-price advertising and low prices is also striking. It appears to reflect the entry of large-scale retail firms into markets that permit non-price advertising.⁵⁷

Similar findings are reported in studies of other industries. Cady (1976) considers the U. S. retail market for prescription drugs in 1970, when legal restrictions on retail advertising varied across states. He finds that retail prices are significantly and positively related to advertising restrictions, and he also reports a price-reducing influence for non-price advertising. Maurizi and Kelly (1978) compare retail gasoline prices across major cities. They find that both the mean and variance of prices are lower in states where price advertising is allowed. The same finding is reported by Feldman and Begun (1978, 1980), who study the price of examinations performed by optometrists. The optometry industry is also the subject of an important FTC (1980) study. Using FTC data, Kwoka (1984) finds that non-advertising and especially advertising firms reduce the price of examinations in markets for which advertising is allowed.⁵⁸ Using survey data for the routine legal service market in 17 U.S. metropolitan areas, Schroeter, Smith and Cox (1987) report evidence that price-cost ratios are lower when area-wide advertising intensity is greater. These studies all support the informative view.

As Benham acknowledges, it is possible that advertising restrictions and prices are both endogenous variables that reflect some underlying influence; for example, if sellers are well organized in a given region, then they may be able to secure legislation (advertising restrictions) that facilitates their collusive conduct (high prices). This concern motivates two longitudinal efforts. First, Glazer (1981) compares supermarket food prices in Queens, New York and Long Island, over a two-month period in 1978 when a newspaper strike limited the price information that could be communicated through advertising in Queens. The newspaper strike is clearly an exogenous source of variation in advertising restrictions. For a few commonly advertised grocery items, Glazer reports that relative prices rose in

⁵⁷Benham and Benham (1975), Haas-Wilson (1986) and an FTC (1980) study consider the impact of a range of commercial practice restrictions in the optometry industry. These studies suggest that restrictions impede the flow of information from firms to consumers and thus deter the entry of large-scale (“commercial”) firms that offer low prices.

⁵⁸An important issue is whether the quality-adjusted price is also lower at advertising firms. For different perspectives, see Kwoka (1984) and Parker (1995).

Queens during the strike, before returning to normal levels at the end of the strike. Second, Milyo and Waldfogel (1999) consider the liquor industry and make use of an exogenous shock: the 1996 Supreme Court ruling that overturned Rhode Island's ban on advertising prices of alcoholic beverages.⁵⁹ Using data for 33 alcoholic beverage products at 115 stores between 1995 and 1997, they find that advertising stores substantially cut the prices of advertised products and have lower prices on average than other stores. In contrast to Stigler's (1961) predictions, however, the introduction of price advertising has little effect on the prices of non-advertised products and is not associated with a reduction in price dispersion across stores.

In summary, the impact of manufacturer advertising on retail prices is complex. There is some evidence, though, that manufacturer advertising may encourage loss-leaders featuring the advertised item and facilitate the growth of low-price discount outlets. For many industries, there is also substantial evidence that retail advertising leads to lower retail prices. Recent work, however, suggests that the distinction between the effect of advertising on the prices of advertised and non-advertised products warrants greater attention.

3.2.5. Quality

According to Nelson (1974b), when a product is heavily advertised, it is more likely that the quality of the product is high. I summarize now empirical work that examines further the relationship between advertising and quality.

In most empirical studies, a positive relationship between advertising and product quality is observed in some circumstances, but the relationship fails (or weakens) in other circumstances. For example, Archibald, Haulman and Moody (1983) examine the market for running shoes for 178 brands. They consider the correlation between advertising levels and product quality, where quality is measured by published rankings in the magazine *Runners' World*. The correlation between advertising and quality is found to strengthen significantly after the publication of ratings. Caves and Greene (1996) consider 196 product categories and evaluate the rank correlations between brands' product-quality rankings and advertising outlays, where quality rankings are measured using *Consumer Reports* data. They find that advertising and quality are generally uncorrelated

⁵⁹For an earlier longitudinal study of the liquor industry, see Luksetich and Lofgreen (1976), who argue that legislation that relaxed restrictions against price advertising in Minnesota resulted in lower retail prices.

among brands. The advertising-quality relationship is positive, however, for innovative goods and also goods for which buyers' experience and search are both useful in making the brand choice. Finally, Tellis and Fornell (1988) explore the advertising-quality relationship over the product life cycle. Using PIMS data for a sample of 749 consumer businesses for the period 1970-1983, wherein a firm's product quality is measured on the basis of a (confidential) self-assessment, they find that advertising, market share and profitability are all positively associated with product quality. They observe further that these relationships are especially strong at later stages in the product life cycle.⁶⁰

A common theme in these studies is that consumers are responsive to advertising that contains direct information as to product quality. This suggests that a positive advertising-quality relationship often may reflect the differential benefit that firms with high-quality products enjoy from providing direct product-quality information through their advertisements. The study by Archibald, Haulman and Moody, for instance, suggests that firms with high rankings are eager to communicate this information to consumers through advertising. Likewise, Caves and Greene (1996, p. 50) explain that their findings are "consistent with advertising as information, if higher quality goods have more features or capabilities (which buyers learn from verifiable advertised information)." The findings of Tellis and Fornell can be viewed in this way, as well. To interpret the strengthening of the relationship over the product life cycle, Tellis and Fornell explain that it is less tempting for a low-quality firm to advertise once the product matures, in part because consumers are then better informed.

This discussion highlights the distinction between direct and indirect product-quality information. In fact, this distinction becomes ambiguous, once it is allowed that consumers have imperfect memories. As Nelson (1974b) argues in his discussion of the repeat-business effect, a firm with a high-quality product gains more from rekindling the memories of its old consumers, and the fact that the firm advertises therefore represents a source of indirect information to new consumers. But advertising is then also a means by which old consumers gain access to direct information that concerns the product's quality and attributes. From this perspective, an advertisement that provides indirect information to new consumers simultaneously provides direct information to old consumers. The "memory-activation" role for advertising may be of special value for firms with

⁶⁰For additional studies that report evidence of a positive advertising-quality relationship, see Marquardt and McGann (1975) and Rotfeld and Rotzoll (1976). Kirmani and Rao (2000) offer a recent survey.

high-quality goods that are in the later stages of the product life cycle. This suggests that the life-cycle pattern observed by Tellis and Fornell might emerge, even if the content of advertisements for mature, high-quality products is not more informative in some literal sense.⁶¹

Experimental work offers a means by which a researcher might gain direct evidence as to the manner in which advertising influences consumers' perceptions. The experiments conducted by Homer (1995), Kirmani and Wright (1989) and Kirmani (1990, 1997) are of particular interest. These studies examine how subjects' expectations about product quality are affected by perceived advertising expenditures. An inverted-U relationship is suggested. Provided that advertising expenditures are not unreasonably high, consumers perceive higher advertising expenditures as indicating that the manufacturer has greater confidence in the quality of the product. When advertising levels reach excessive levels, however, consumers may infer that the manufacturer lacks confidence in the product's quality and is desperate. These studies provide some evidence that consumers infer a positive relationship between advertising expenditures and product quality. This inference is broadly consistent with Nelson's (1974b) reasoning.

There exists also a small literature that examines the advertising-quality relationship in the retail sector. Utilizing state-level variation in advertising restrictions for the optometry industry, Kwoka (1984) considers whether the ability to advertise results in a deterioration in quality of eye examinations, where quality is measured as time spent in the examination. In comparison to firms in states that restrict advertising, advertising firms offer lower quality but non-advertising firms select higher quality. In total, Kwoka's work thus suggests that the presence of advertising serves to (i) reduce prices and lower quality at advertising firms, and (ii) reduce (to a smaller extent) prices and raise quality at non-advertising firms. Kwoka also suggests that average quality is higher in markets for which advertising is allowed than in markets for which it is not.⁶² This suggestion, however, is disputed by Parker (1995), who considers alternative measurements of quality.

What are the main lessons? Perhaps the main finding is a negative one: the studies described here do not offer strong support for the hypothesis of a system-

⁶¹This suggestion is of particular relevance, in light of work by Arterburn and Woodbury (1981) and Resnik and Stern (1978) that studies the content of magazine and TV advertising. Their studies suggest that little "hard" information is supplied through these media.

⁶²Similarly, Haas-Smith (1986) studies the price of an eye examination bundled with a pair of glasses, where quality is measured by the thoroughness of the eye examination and the accuracy of the eyeglass prescription. She finds that commercial practice restrictions raise price without increasing quality.

atic positive relationship between advertising and product quality. The studies do suggest, however, that a positive relationship is more likely when advertising conveys direct information (broadly defined) to consumers. Finally, when advertising is allowed in retail service industries, there is some evidence that advertising firms may have lower product quality and non-advertising firms may have higher product quality than they would were advertising not allowed.

3.3. Summary

At a broad level, the empirical research described here offers progress on three fronts. First, it indicates clearly that no single view of advertising is valid in all circumstances. This in itself is progress, and especially so when compared to the absolutist tone adopted in many of the initial discussions of advertising.⁶³ Second, progress is also achieved at a more constructive level: a number of important regularities are identified that hold within particular industries or narrow industry categories. Finally, progress is also apparent at a methodological level. While some of the earlier empirical work regards advertising as a structural variable that proxies for product differentiation, subsequent work is increasingly attentive to the endogeneity of advertising and the interpretive as well as econometric issues that endogeneity implies.

As mentioned in the Introduction, the empirical studies suggest important roles for advertising theory. Theoretical work might offer important insight into questions - Is advertising excessively supplied? Does it deter entry? - that the empirical analyses fail to resolve. In addition, theoretical work may provide novel interpretations of some of the constructive findings that the empirical analyses offer for different market structures. New predictions may also emerge. Finally, with advances in advertising theory, a foundation may be provided from which to specify the endogenous determination of advertising, so that future empirical analyses might proceed at a more structural level. With these roles in mind, I present in the next four sections a review of the economic theory of advertising.

4. Monopoly Advertising

In this section, I focus on positive and normative theories of monopoly advertising. The monopoly case is of interest in its own right, and it also represents a

⁶³As Lambin (1976, p. 99) puts it: “The feeling that emerges is that the economic power of advertising has been overstated by critics and apologists of advertising.”

simple setting within which to begin the formal analysis of advertising. In subsequent sections, I consider more advanced topics, including multi-firm markets and monopoly advertising that signals product quality.

4.1. The Positive Theory of Monopoly Advertising

In the preceding two sections, it is emphasized that any observed relationship between advertising and other variables (e.g., profit) must be interpreted with great care, since advertising is endogenous. At a broad level, the significance of this idea can be appreciated without the aid of a formal model, and indeed I have proceeded on this assumption. The development of a formal theory, however, does make possible important additional insights. In a classic paper, Dorfman and Steiner (1954) offer one of the first formal theories of optimal monopoly advertising.⁶⁴ This theory identifies the key structural features on which endogenous monopoly advertising depends, and it also offers a general framework within which specific theories of monopoly advertising may be developed.

4.1.1. The Dorfman-Steiner Model

The Dorfman-Steiner model takes the following form. Suppose that a monopolist chooses the price of its product, P , and a level of advertising, A , where A may denote the number of fliers sent, minutes of TV or radio time bought, etc. The cost per advertisement is assumed constant and is given by κ . The market demand function is represented as $D(P, A)$, where attention is restricted to $(P, A) \geq 0$ for which $D > 0$ and $D_A > 0 > D_P$. The monopolist's variable cost of production is given by $C(D(P, A))$, where $C' > 0$. Under these assumptions, the monopolist's profit function is defined as $\Pi(P, A) \equiv PD(P, A) - C(D(P, A)) - \kappa A$. This model assumes that consumers respond to advertising, but it does not explain why. The model is therefore not yet suitable for normative analysis. It is, however, possible to use only the assumptions just given and derive a positive theory of monopoly pricing and advertising.

To this end, it is useful to examine the first-order conditions for profit maximization. Assuming throughout that second-order conditions hold, the monopolist maximizes profit if and only if its price and advertising selections satisfy the

⁶⁴See also Rasmussen (1952), who presents a formal analysis of optimal advertising but imposes the assumption that price is fixed. See Schmalensee (1972) for further discussion.

following first-order conditions:

$$\Pi_P = (P - C')D_P + D = 0 \quad (4.1)$$

$$\Pi_A = (P - C')D_A - \kappa = 0 \quad (4.2)$$

Let $P_M(A)$ denote that price that satisfies (4.1). This is the profit-maximizing price for any given level of advertising. Similarly, for any given price, let $A_M(P)$ denotes the advertising level that satisfies (4.2). The monopolist maximizes profit with its joint selection of price and advertising when it picks a pair (P_M, A_M) such that $(P_M, A_M) = (P_M(A_M), A_M(P_M))$.

To interpret the first-order conditions, let $\varepsilon_P \equiv -PD_P/D$ and $\varepsilon_A \equiv AD_A/D$ denote the price and advertising elasticities of demand, respectively. Manipulation of (4.1) yields the familiar markup rule:

$$\frac{(P - C')}{P} = \frac{1}{\varepsilon_P} \quad (4.3)$$

Substituting (4.3) into (4.2), it follows that the marginal revenue from a dollar increase in advertising expenditure must equal the price-elasticity of demand:

$$\frac{PD_A}{\kappa} = \varepsilon_P. \quad (4.4)$$

The ratio of advertising expenditures to sales revenue, or the advertising intensity, is $\kappa A/PD$. Using (4.4), the advertising intensity must equal the ratio of elasticities of demand with respect to advertising and price:

$$\frac{\kappa A}{PD} = \frac{\varepsilon_A}{\varepsilon_P}. \quad (4.5)$$

The proportion of sales revenue that a profit-maximizing monopolist spends on advertising is thus determined by a simple elasticity ratio.⁶⁵

Dorfman and Steiner provide a formal expression for some of the reverse-causality concerns that are raised in Sections 2 and 3. For example, consider the persuasive-view hypothesis that a high advertising intensity makes the demand function more price inelastic and thereby leads to a large markup. Dorfman and Steiner provide a formal basis under which the reverse causal pattern also may be advanced: all else equal, when the demand function is more price inelastic (i.e., when ε_P is smaller), a profit-maximizing monopolist chooses a high advertising intensity and a large markup.

⁶⁵Related rules may be derived in dynamic settings with goodwill effects. See Nerlove and Arrow (1962), Friedman (1983), Gould (1970) and Schmalensee (1972).

4.1.2. Two Examples

This general framework places little restriction on the manner in which advertising impacts demand. By imposing further structure, it is possible to capture some of the effects emphasized under alternative views of advertising. I consider two examples.⁶⁶ In the first example, monopoly advertising raises the willingness of consumers to pay and thereby generates an upward shift in the monopolist's demand function. This example is illustrative of the persuasive view. In the second example, monopoly advertising informs new consumers that the product exists and thereby generates an outward shift in the monopolist's demand function. This example is illustrative of the informative view. At a positive level, both examples are compatible with the complementary view.

In the first example, each consumer considers whether to buy a unit of the monopolist's product, where the consumer's valuation for this product may be influenced by the monopolist's advertising. Consumers are "vertically differentiated" with respect to the influence of advertising on their valuations. Formally, when the monopolist advertises at level A and sets the price P , a consumer of type θ enjoys utility $\theta g(A) - P$ if the consumer buys one unit of the monopolist's product, where $g(0) = 1$ and $g'(A) > 0$. The consumer receives zero utility otherwise. There is a mass of consumers of size $N > 0$, and θ is uniformly distributed over $[0, 1]$. A consumer of type θ thus buys the monopolist's product if and only if $\theta \geq P/g(A)$, and so the market demand function is $D(P, A) = N[1 - P/g(A)]$.

As the persuasive view suggests, when advertising is increased, the demand function becomes more inelastic. Formally, it is easily derived that $\varepsilon_P = P/(g(A) - P)$, so that the elasticity effect is $\frac{d\varepsilon_P}{dA} < 0$. The persuasive view also holds that the profit-maximizing price, $P_M(A)$, rises when the level of advertising is raised, provided that no offsetting scale effect is present. Using (4.1), it may be confirmed that $\Pi_{PA} = N[g' + C''D_A]/g$ when evaluated at $P = P_M(A)$. It follows that:

$$\text{sign}\{P'_M(A)\} = \text{sign}\{g' + C''D_A\}. \quad (4.6)$$

Therefore, if marginal cost is constant or increasing, then the monopoly price indeed does rise when advertising is increased. On the other hand, if there is a significant scale effect, then greater advertising could lower the monopoly price.

Further insight can be developed using the inverse demand function. This function is represented here as $P(A, Q) = g(A)(1 - Q/N)$, where Q denotes the quantity of units sold. Observe that $P_{AQ} = -g'/N < 0$, which indicates that

⁶⁶See also Pepall, Richards and Norman (1999, Chapter 10) for a similar presentation.

advertising shifts up the demand function by more at lower quantities. Intuitively, the marginal consumer has a lower θ and thus gets a smaller valuation gain from an advertising increase than do the inframarginal consumers who have higher θ 's. Figure 2 illustrates.

The second example builds on an approach suggested by Butters (1977). Suppose there are N consumers, each of whom possesses the same individual demand function, $d(P)$, for the monopolist's product, where d is positive and decreasing below a reservation price: $d'(P) < 0$ for $P \in [0, R]$ and $d(R) = 0$. The monopolist chooses the number of advertising messages, A , that are sent. Each "ad" is received by exactly one consumer, and each consumer is equally likely to receive any given ad. A consumer becomes aware of the monopolist's product only by receiving an ad. The probability that a consumer receives no ad is then $[1 - 1/N]^A \approx e^{-A/N}$ for N large. The market demand function is thus $D(P, A) = N[1 - e^{-A/N}]d(P) \equiv G(A)d(P)$. Observe that $G' > G(0) = 0 > G''$.

As the informative view suggests, when advertising is increased, the demand function does not become more inelastic. In fact, advertising here has no elasticity effect: $\frac{d\varepsilon_P}{dA} = 0$.⁶⁷ Consider next the impact of an increase in the level of advertising upon the profit-maximizing price, $P_M(A)$. Using (4.1), it is readily shown that $\Pi_{PA} = -D_P C'' D_A$ when evaluated at $P = P_M(A)$. Therefore, for $A > 0$, the effect of advertising on the monopoly price is entirely dictated by the scale effect:

$$\text{sign}\{P'_M(A)\} = \text{sign}\{C''\}. \quad (4.7)$$

In contrast to the first example above, if marginal cost is constant, then advertising has no effect on the monopoly price.

The inverse demand function is now $P(A, Q) = d^{-1}(Q/G(A))$, where d^{-1} is a strictly decreasing function. Calculations reveal that $P_{AQ} > 0$ provided that a demand-curvature condition, $dd'' - (d')^2 < 0$, is satisfied. Under this condition, advertising shifts up the demand function by more at higher quantities. Intuitively, at a given level of advertising, if the quantity is high, then the individual demand, $d(P)$, must be high, and so a low price is implied. From this starting point, an increase in advertising would lead to a significant volume increase, as new consumers would bring forth large individual demands at the low price. Hence, if the original volume is to be maintained, then a significant price increase is required. Figure 3 illustrates.

⁶⁷The informative view in fact holds that advertising *increases* the price-elasticity of demand. This effect arises in differentiated-goods markets with multiple firms, as I discuss in Section 5.2.

Finally, it is interesting to link these examples back to the earlier literature. Two points warrant emphasis. First, the examples confirm Chamberlin's insight: the effect of advertising on price is determined by the elasticity and scale effects of advertising, where the former is itself determined by the purpose (persuasion or information) of advertising. The second point concerns the market demand function D under the informative view. This function is strictly increasing and concave in A , and it captures formally Ozga's rationale for diminishing returns. In particular, at a higher level of advertising, the benefit of additional advertising is lower, since it becomes less likely that a new ad reaches a consumer who has not already learned of the product's existence.

4.2. The Normative Theory of Monopoly Advertising

Does a monopolist advertise to an extent that is socially excessive, inadequate or optimal? Many of the earliest commentators on advertising offer unequivocal answers, but the theoretical frameworks on which their answers are based are rarely clarified. Empirical efforts also fail to offer a conclusive answer. Perhaps advances in theory might provide a means by which to answer this question with guarded confidence. Motivated by this prospect, I offer here a formal discussion of the recent development of the normative theory of monopoly advertising. Under the assumption that advertising is utility increasing (a good), this work suggests that a profit-maximizing monopolist may advertise to an extent that is socially inadequate. To develop this suggestion, I use the model and two examples presented just above. They constitute a unifying framework in which to present recent developments in the persuasive, informative and complementary views.

4.2.1. The Persuasive View

Under the persuasive view, advertising changes the preferences of consumers. An issue thus arises as to the standard by which consumer welfare should be assessed. Braithwaite offers the first analysis of this kind. As discussed in Section 2.2, she measures consumer welfare relative to pre-advertising tastes, and she establishes that monopoly advertising lowers consumer welfare if the monopoly price rises or remains unchanged when advertising occurs. As Figure 1 illustrates, consumer surplus may (but need not) increase if advertising is coupled with a decrease in the monopoly price. Intuitively, advertising induces a consumption distortion: consumers purchase additional units at a price that exceeds what those units are "truly" worth. This consumer-welfare loss, L , due to advertising can be offset only

if the price falls, so that there is a consumer-welfare gain, G , from the purchase of truly desirable units at a lower price.

But a complete welfare analysis requires as well that the impact of advertising on profit be considered. This step is taken by Dixit and Norman (1978). To understand their argument, consider Figure 4, in which an increase in advertising from A_0 to A_1 results in an outward shift in demand from $D(P, A_0)$ to $D(P, A_1)$. As depicted, Dixit and Norman assume that the additional advertising increases price from P_0 to P_1 and quantity sold from $D(P_0, A_0)$ to $D(P_1, A_1)$. Let $\Delta A \equiv A_1 - A_0 > 0$ and $\Delta P \equiv P_1 - P_0 > 0$. For simplicity, they suppose that the marginal cost of production, C' , is constant.

Two interpretations are possible. First, if $A_0 = 0$, then the initial demand curve, $D(P, A_0)$, corresponds to a market without advertising, so that the subsequent demand curve, $D(P, A_1)$, reflects the level of demand once advertising is allowed. Second, if $A_0 > 0$, then the demand shift describes a market with an initial level of advertising that is subsequently increased. Allowing for either interpretation, I refer to $D(P, A_0)$ as the *initial demand curve* and to $D(P, A_1)$ as the *subsequent demand curve*. Dixit and Norman are flexible when it comes to the precise standard by which consumer welfare is measured; however, they do require that the same standard be used before and after advertising is increased. I define the *initial (subsequent) standard* as the consumer surplus associated with the initial (subsequent) demand curve.

Consider first the case in which the initial standard is used. As Braithwaite observes, under the assumption that advertising leads to a higher price, consumer welfare is then decreased by advertising, due to the induced consumption distortion: consumers pay more for additional units than those units are truly worth, as depicted by the area Z , and pay more now for units that were desirable even before the change in advertising, as captured by the area X . The change in consumer surplus under the initial standard is thus $\Delta CS_0 \equiv -[X + Z] < 0$. But the monopolist enjoys an increase in producer surplus in amount $X + Z + V > 0$. The change in the monopolist's profit, $\Delta \Pi \equiv \Pi(P_1, A_1) - \Pi(P_0, A_0)$, balances the increase in producer surplus against the additional advertising expenditure: $\Delta \Pi = X + Z + V - \kappa \Delta A$. Under the assumption that the advertising industry operates at constant cost and earns zero rents, the resource cost of advertising, $\kappa \Delta A$, is the same for the monopolist as for society. The change in welfare under the initial standard, $\Delta W_0 \equiv \Delta CS_0 + \Delta \Pi$, is thus determined as $\Delta W_0 = V - \kappa \Delta A$.

While the monopolist and a social planner agree on the cost of advertising, they disagree on the size of the benefit that additional advertising implies. Consider a

small increase in advertising. Then, quantity and price both change little, and so Z is second order in size. The following relationship is apparent:

$$\Delta W_0 \approx \Delta \Pi - D(P_0, A_0)\Delta P. \quad (4.8)$$

The disagreement thus emerges because consumers must pay a higher price on units that were purchased even in the initial situation. The transfer has no welfare significance, but it does increase monopoly profit. Under the initial standard, therefore, the private benefit to the monopolist of small expansion in advertising that results in a higher price exceeds the social benefit.

Consider second the case in which the subsequent standard is adopted. The same logic applies. To see this, observe that the change in consumer surplus, ΔCS_1 , is now captured in Figure 4 as $\Delta CS_1 = Y - X$, where Y reflects the new consumer surplus that is enjoyed under the subsequent standard when additional units are consumed at the price P_1 . The monopolist's change in profit remains $\Delta \Pi = X + Z + V - \kappa \Delta A$. The change in welfare under the subsequent standard, $\Delta W_1 \equiv \Delta CS_1 + \Delta \Pi$, is thus determined as $\Delta W_1 = Y + Z + V - \kappa \Delta A$. As before, for a small increase in advertising, quantity and price both change little, and so Z and now Y are second order in size. But this means that the welfare difference under the two standards, $\Delta W_1 - \Delta W_0$, is second order. Indeed, for small changes, we obtain the same formula

$$\Delta W_1 \approx \Delta \Pi - D(P_0, A_0)\Delta P. \quad (4.9)$$

Thus, even under the subsequent standard, the private benefit to the monopolist of a small expansion in price-increasing advertising exceeds the social benefit.

Using (4.8) and (4.9), two findings are obtained. First, for a small increase in advertising, whether the initial or subsequent standard is used, the monopolist will not undersupply and may oversupply price-increasing advertising. Put differently, for a small amount of price-increasing advertising, private profitability is necessary, but not sufficient, for social desirability. Next, suppose that (i) the initial and subsequent advertising levels are given as $A_0 = A_M - \Delta A < A_M = A_1$, and (ii) for any advertising level A , the monopolist chooses its profit-maximizing price, $P_M(A)$. Given the assumption that advertising is price-increasing, it follows that $P_0 = P_M(A_M - \Delta A) < P_M(A_M) = P_M = P_1$. An envelope argument is now available: under (4.1) and (4.2), when the price-advertising pair is increased slightly from (P_0, A_0) to (P_1, A_1) , there is no first-order effect on monopoly profits and hence $\Delta \Pi = 0$. According to (4.8) and (4.9), social welfare would rise under either standard if the monopolist were to slightly reduce its advertising and

price from their profit-maximizing levels. A second finding is thus established: monopoly advertising that increases price is excessive.⁶⁸

These are striking findings. But important concerns may be raised. A first concern is the assumption that advertising increases price. As discussed in Section 3.2.4, in multi-firm markets at least, the empirical support for the price-increasing assumption is mixed. Likewise, in the positive models of advertising, the price-increasing assumption finds mixed theoretical support: under constant marginal costs, the assumption holds in the first but not the second example. A second concern is the manner in which Dixit and Norman measure consumer welfare. This concern is more subtle, and I turn to it next.

4.2.2. An Alternative Approach

Under the Dixit-Norman approach, the impact of advertising on consumer welfare is measured relative to a fixed standard. Price-increasing monopoly advertising is then excessive, since the monopolist is motivated by the prospect of obtaining a higher price on those units that are initially purchased. This accounts for the term $D(P_0, A_0)\Delta P$ in (4.8) and (4.9). As Dixit and Norman acknowledge, an important feature of their approach is that the area between the initial and subsequent demand curves on infra-marginal units (i.e., units below $D(P_0, A_0)$) plays no part in the calculations. In Figure 4, this is depicted by the area U .

An alternative perspective is that the right comparison is rather between the consumer surplus under the initial demand curve at the price-quantity pair $(P_0, D(P_0, A_0))$ with the consumer surplus under the subsequent demand curve at the price-quantity pair $(P_1, D(P_1, A_1))$. For small changes, this amounts to a comparison between consumer surplus under $D(P, A_0)$ at the price-quantity pair $(P_0, D(P_0, A_0))$ with the consumer surplus under $D(P, A_1)$ at the price-quantity pair $(P_1, D(P_0, A_0))$. Intuitively, the “Dixit-Norman term,” $D(P_0, A_0)\Delta P$, would enter into this comparison and again provide an influence toward excessive price-increasing monopoly advertising. But a new “infra-marginal term,” corresponding to the area U , would also arise. The latter term would account for the additional consumer surplus that advertising generates on the initial units as demand shifts from $D(P, A_0)$ to $D(P, A_1)$. This additional surplus arises regardless of the direction of the change in price, and it represents a social benefit from advertising

⁶⁸It is also possible to evaluate the increase in advertising from $A_0 = A_M - \Delta$ to $A_1 = A_M$ using the pre-advertising standard (i.e., the consumer surplus associated with the demand curve $D(P, 0)$). As Dixit and Norman show, the case for excessive advertising is then even greater, since advertising induces a (first-order) consumption-distortion cost.

that the monopolist cannot appropriate. Accordingly, the infra-marginal term provides an influence toward inadequate monopoly advertising.

The Dixit-Norman and alternative approaches can be understood with reference to the two examples presented above. The Dixit-Norman approach may be associated with the first example, if it is assumed that an existing consumer of type θ does not experience a “real” gain in utility when advertising is increased. The alternative approach is founded on the informative and the complementary views. First, in line with the second example presented above and as Kotowitz and Mathewson (1979a) and Shapiro (1980) explain, the upward shift in demand might reflect informative advertising that brings new consumers into the market. Surely, the surplus enjoyed by these consumers should enter into the welfare calculation. Second, as Fisher and McGowan (1980) emphasize, even in the first example, it is possible that consumers value the social prestige that an advertised product may facilitate.

Two conclusions of the alternative approach may now be anticipated. First, monopoly advertising is inadequate, if advertising does not raise price. Intuitively, in the case of price-maintaining or price-decreasing advertising, the Dixit-Norman term is neutral or reinforces the infra-marginal term. Second, monopoly advertising may be inadequate, even if advertising raises price. In this case, the Dixit-Norman and infra-marginal terms pull in opposite directions, but the latter may dominate if the price increase is not too great. This second conclusion, of course, contrasts directly with the implication under the persuasive view (as formalized by Dixit and Norman) that a monopolist always supplies price-increasing advertising to a socially excessive extent.

With the central ideas now in place, I now formalize the alternative approach and develop its two main conclusions. Drawing on the two examples, I also develop the informative and complementary foundations for the alternative approach in some further detail.

4.2.3. Price-Maintaining and Price-Decreasing Monopoly Advertising

For a given price and advertising level, let social welfare be defined as

$$W(P, A) = \Pi(P, A) + \int_P^{R(A)} D(P, A) dP, \quad (4.10)$$

where $R(A)$ satisfies $D(R(A), A) = 0$ and may vary with A . Notice that this

formulation captures the alternative approach: under (4.10), when the price-advertising pair changes from (P_0, A_0) to (P_1, A_1) , the change in consumer welfare is calculated by comparing the consumer surplus under $D(P, A_0)$ at the price-quantity pair $(P_0, D(P_0, A_0))$ with the consumer surplus under $D(P, A_1)$ at the price-quantity pair $(P_1, D(P_1, A_1))$.

In line with the Dixit-Norman analysis, suppose now that (i) the monopolist begins at its monopoly solution, (P_M, A_M) , and (ii) when advertising is changed to some nearby level A , the monopolist responds with its profit-maximizing price, $P_M(A)$. Using (4.10), it then follows that

$$\begin{aligned} \frac{dW(P_M(A), A)}{dA} \Big|_{A=A_M} = & \left\{ \frac{d\Pi(P_M(A), A)}{dA} + D(R(A), A)R'(A) \right. & (4.11) \\ & \left. - D(P_M(A), A)P'_M(A) + \int_{P_M(A)}^{R(A)} D_A(P, A)dP \right\} \Big|_{A=A_M} \end{aligned}$$

Under (4.1) and (4.2), advertising does not have a first-order effect on profit. Given that $D(R(A), A) = 0$, (4.11) thus may be re-written as

$$\frac{dW(P_M(A), A)}{dA} \Big|_{A=A_M} = -D(P_M, A_M)P'_M(A_M) + \int_{P_M}^{R(A_M)} D_A(P, A_M)dP. \quad (4.12)$$

As the discussion above anticipates, there are two terms. The first term in (4.12) is the Dixit-Norman term. The sign of this term is dictated by the impact of advertising on price. The second term in (4.12) is the new infra-marginal term. The sign of this term is positive.

The first conclusion is now established: if additional advertising would not cause the monopolist to raise its price (i.e., if $P'_M(A_M) \leq 0$), then welfare would be increased were the monopolist to raise its advertising above the monopoly level. Put differently, the monopoly supply of price-decreasing and price-maintaining advertising is inadequate. Intuitively, in the absence of a price increase, additional monopoly advertising induces a consumer-surplus gain that the monopolist cannot appropriate; therefore, the monopolist advertises to an inadequate extent.

To see this conclusion in action, consider the case of informative monopoly advertising, as captured in the second example above. The appropriate measure of welfare is then given by (4.10), where $D(P, A) = G(A)d(P)$ and $R(A) \equiv R$. Using (4.7), the first conclusion now may be stated at a structural level: when

advertising is informative, monopoly advertising is inadequate if marginal cost is constant or decreasing. Kotowitz and Mathewson (1979a) and Shapiro (1980) offer early statements of this result for the case of constant marginal costs.

Consider next the case of complementary advertising. The first conclusion is of course valid for this case as well, and indeed Nichols (1985) and Becker and Murphy (1993) offer general derivations of this conclusion. But when advertising has a social-prestige component, the possibility that advertising is price-increasing is of special relevance. In the first example above, consumers directly value advertising, and greater monopoly advertising generates a higher monopoly price when marginal cost is constant or increasing. In this case, it cannot be concluded from (4.12) that complementary monopoly advertising is inadequate. The possibility of price-increasing advertising thus requires further consideration.

4.2.4. Price-Increasing Monopoly Advertising

When advertising increases price, the Dixit-Norman and infra-marginal effects are conflicting. In the presence of conflicting effects, one strategy is to directly calculate the net consumer-welfare effects of advertising for the problem at hand. Another strategy is to look for a new sufficient condition under which one effect dominates the other. Both strategies are illustrated here.

I start with a net welfare calculation. Consider the first example, under which welfare is given by (4.10) when $D(P, A) = N[1 - P/g(A)]$ and $R(A) = g(A)$. Suppose further that marginal cost is constant at some level c , where $0 < c < g(0)$. Then (4.1) may be solved, yielding $P_M(A) = [g(A) + c]/2$, so that $P'_M(A_M) = g'(A_M)/2 > 0$. Notice that $D(P_M, A_M) = N[g(A_M) - P_M]/g(A_M) > 0$ and $D_A = NPg'/g^2 > 0$. Using (4.12), it can be shown that

$$\frac{dW(P_M(A), A)}{dA} \Big|_{A=A_M} = D_A(P_M, A_M)D(P_M, A_M)g(A_M)/2N > 0.$$

Thus, even though advertising raises price and induces a welfare-reducing Dixit-Norman effect, it also shifts out demand and generates a welfare-enhancing infra-marginal effect. In the first example, the latter effect dominates, so that even price-increasing advertising is inadequately supplied by a monopolist.

The second strategy is to look for a new sufficient condition that allows for price-increasing advertising. To this end, I borrow from the product-quality analysis offered by Spence (1975) and Tirole (1988, Section 2.2.1), with advertising now substituting for product quality. The analysis is conducted with reference to the inverse-demand function, $P(Q, A)$, where $P_A > 0 > P_Q$. In this context, the

monopolist's profit function is given as $\pi(Q, A) = P(Q, A)Q - C(Q) - \kappa A$. The first-order conditions for profit maximization are then:

$$\pi_Q = P - C' + QP_Q = 0 \quad (4.13)$$

$$\pi_A = QP_A - \kappa = 0 \quad (4.14)$$

Let $Q_m(A)$ denote the solution to (4.13), and let $A_M(Q)$ represent the solution to (4.14). The monopoly solution, (Q_M, A_M) , is then defined by $Q_M = Q_m(A_M)$ and $A_M = A_M(Q_M)$.

Social welfare may be represented as

$$W(Q, A) = \int_0^Q P(X, A)dX - C(Q) - \kappa A. \quad (4.15)$$

Suppose now that (i). the monopolist begins at its monopoly solution, (Q_M, A_M) , and (ii). when advertising is changed to some nearby level A , the monopolist responds with its profit-maximizing quantity, $Q_M(A)$. Then, using (4.15),

$$\frac{dW(Q_M(A), A)}{dA} \Big|_{A=A_M} = [P(Q_M, A_M) - C'(Q_M)]Q'_M(A_M) + \int_0^{Q_M} P_A(X, A_M)dX - \kappa. \quad (4.16)$$

This expression can be signed under two conditions. Assume first that the value of advertising is greater for infra-marginal than marginal consumers: $P_{AQ} < 0$. Assume second that advertising beyond the monopoly level does not decrease the profit-maximizing level of output: $Q'_M(A_M) \geq 0$. Then, by (4.16),

$$\begin{aligned} \frac{dW(Q_M(A), A)}{dA} \Big|_{A=A_M} &> [P(Q_M, A_M) - C'(Q_M)]Q'_M(A_M) + Q_M P_A(Q_M, A_M) - \kappa \\ &= -Q_M P_Q(Q_M, A_M)Q'_M(A_M) \\ &\geq 0, \end{aligned}$$

where the first inequality uses $P_{AQ} < 0$, the equality uses (4.13) and (4.14), and the second inequality uses $Q'_M(A_M) \geq 0$. With this, a second conclusion is now

established: if $P_{AQ} < 0$ and $Q'_M(A_M) \geq 0$, then advertising is supplied by a monopoly to an extent that is socially inadequate.⁶⁹

The key intuition can be easily summarized. As (4.14) reveals, when the monopolist chooses advertising while holding quantity fixed, it balances the cost of additional advertising against the benefit of selling the fixed quantity at a higher price. The extent to which price rises is in turn measured by the benefit that additional advertising brings to the marginal consumer. On the other hand, as (4.15) suggests, a social planner balances the cost of additional advertising against the benefit it brings to all of the monopolist's consumers. If $P_{AQ} < 0$, then the marginal consumer gets the least benefit from additional advertising; thus, for a given quantity, the monopolist provides too little advertising. As is standard, for any given level of advertising, the monopolist also provides too little quantity. It follows that welfare would rise if the monopolist were to increase advertising without decreasing quantity.

This analysis dovetails nicely with the first example. Under constant marginal costs, this example satisfies both of the two conditions: $P_{AQ} < 0$ is established above, and $Q'_M(A_M) \geq 0$ is easily confirmed.⁷⁰ Thus, the first example offers a concrete illustration of the sufficient conditions just derived. At the same time, the analysis clarifies the general features that are embodied in the example and that underlie the finding of inadequate advertising. Of course, the second conclusion holds as stated whether advertising is complementary due to the information it conveys or the social prestige that it facilitates. The former case is captured by the second example, but in this example $P_{AQ} > 0$ when individual demands are not too convex. The second conclusion appears most relevant for advertising that facilitates social prestige.

Nichols (1985) presents a related sufficient condition that applies when consumer welfare is the maximized value of $U(g(A)X, Y)$, where X and Y are chosen subject to a budget constraint: $P_x X + P_y Y = I$. Nichols derives that consumer welfare rises with greater advertising if and only if $[g' A/g - P'_M(A)A/P_M(A)] > 0$, where $P_M(A)$ is the monopoly price of good X when A is given. Thus, social welfare rises when the monopolist increases advertising above the monopoly level

⁶⁹Becker and Murphy (1993) also discuss the case of price-increasing advertising, and they derive an expression corresponding to (4.16). They do not derive the two conditions ($P_{AQ} < 0$ and $Q'_M(A_M) \geq 0$) reported here that suffice for inadequate price-increasing monopoly advertising. As I discuss below, Nichols (1985) derives a related sufficient condition for the characteristic approach that he adopts.

⁷⁰In particular, direct calculations confirm that $\frac{dD(P_M(A), A)}{dA}|_{A=A_M} = \frac{Ncg'(A_m)}{2[g(A_M)]^2} > 0$.

if and only if additional advertising increases “prestige productivity” (i.e., g) in a greater percentage than it increases the price of the advertised product. This requirement is automatically satisfied if advertising is price-maintaining or price-decreasing. A limitation of this approach is that g is not easily observed.

Finally, it is important to remark on the possibility raised in Section 2.4 that advertising is a bad that is sold jointly with some other good (e.g., TV programs may compensate viewers for watching TV ads). This possibility is not included in the analysis above, where I follow the conventional modeling approach and assume that advertising is a good whose quantity is determined by the monopolist. But Becker and Murphy argue that the first conclusion above continues to hold when advertising is a bad that is jointly sold. Intuitively, if the consumer voluntarily accepts additional advertising and the price of the good does not rise, then additional monopoly advertising again induces a consumer surplus gain that the monopolist is unable to appropriate.

4.3. Summary

In this section, I summarize research on the positive and normative theory of monopoly advertising. The Dorfman-Steiner model offers a positive theory of a monopolist’s price and advertising selections, and the first-order conditions provide a formal interpretation for some of the endogeneity concerns raised in the previous section. Two examples are also examined. These examples confirm Chamberlin’s insight that advertising’s effect on price is related to the elasticity and scale effects of advertising, where the elasticity effect is determined by whether the purpose of advertising. The second (informative) example also captures Ozga’s rationale for diminishing returns.

Dixit and Norman provide a foundation for the normative theory of persuasive advertising. They argue that, if the consumer welfare that advertising renders is measured relative to a standard that remains fixed as advertising changes, then a monopolist provides price-increasing advertising to an extent that is socially excessive. Proponents of the informative and complementary views, however, argue that the fixed-standard approach ignores consumer-welfare gains from advertising that are associated with information and social prestige. Under the alternative approach that their work suggests, a monopolist provides price-maintaining and price-decreasing advertising to an extent that is socially inadequate. Furthermore, under conditions that are plausible when advertising facilitates social prestige, a monopolist provides even price-increasing advertising to an extent that is socially

inadequate. On the whole, the research described above suggests that a profit-maximizing monopolist may advertise to an extent that is socially inadequate.

At the same time, it is important to highlight two assumptions of the models presented here. First, as mentioned in Section 2.4, the models do not include ads that are utility reducing (bads) and unavoidable. For example, an objectionable ad on a city bus, streetcar or taxi is difficult to avoid, and internet “pop-up” ads are also intrusive. If a monopolist can profit from ads that are objectionable and unavoidable, then the possibility of excessive monopoly advertising would gain renewed credibility. Second, the models assume that the monopolist is unable to segment the market by targeting its ads to certain groups and then practicing price discrimination. If a monopolist can segment its consumers, then it may be able to appropriate the increase in surplus that its advertising creates. It then becomes more likely that the monopolist advertises at a socially optimal level.⁷¹

5. Advertising and Price

Monopoly advertising may be inadequate, since the monopolist cannot appropriate the consumer surplus that additional advertising creates. But in markets with multiple firms advertising is also an important instrument of competition. The advertising of one firm may steal the business and thus diminish the profit of another. This business-stealing externality raises the possibility that advertising may be excessive. In multi-firm markets, it is thus unclear, a priori, whether advertising is inadequate, excessive or optimal.

This tension is recognized by Marshall (1919), who acknowledges both the beneficial constructive and wasteful combative roles that informative advertising may play. In the context of persuasive advertising, an early formalization is offered by Dixit and Norman, who consider not just monopoly but also multi-firm markets. Due to the business-stealing externality, they find that advertising then may be excessive even when it results in a lower price. With important exceptions, however, the recent theoretical literature emphasizes informative advertising.⁷² I

⁷¹For a development of this point, see Adams and Yellen (1977).

⁷²For example, see Friedman (1983) and Schmalensee (1972, 1976b) for positive theories of oligopolistic advertising competition, under the general assumption that a firm’s advertising increases the demand for its product. Kotowitz and Mathewson (1979b) consider a dynamic model of monopoly advertising, under an ad hoc specification as to the manner in which advertising affects consumers’ perceptions as to product quality. Bloch and Manceau (1999) consider duopolistic advertising competition when advertising is persuasive. Becker and Murphy (1993), Hochman and Luski (1988), Nichols (1985) and Stigler and Becker (1977) consider complemen-

summarize here recent theoretical analyses of multi-firm markets in which advertising provides price information.

5.1. Homogeneous Products

In a classic paper, Butters (1977) offers the first equilibrium analysis of informative advertising in a multi-firm model. In Butters's model, firms produce a homogeneous product at a constant unit cost c . There are N consumers. As in the second example above, a consumer can learn of a firm's existence and price only by receiving an ad from that firm, and ads are distributed randomly across consumers at a cost of κ per ad. Finally, and in contrast to the second example, consumers have symmetric unit-demand functions, so that $R - P$ is the surplus that a consumer enjoys when a unit is purchased at price P . To ensure that production has social value, assume that $R > c + \kappa$.

In this multi-firm setting, there are three kinds of consumers. Some consumers are *uninformed*: they receive no ads. Uninformed consumers never learn of any firm, make no purchase and receive zero utility. Other consumers are *captive*: they receive ads from only one firm. A captive consumer knows of one firm and thus buys from that firm, provided that the price does not exceed R . Finally, some consumers are *selective*: they receive ads from more than one firm. A selective consumer buys from the lowest-priced known firm, if that price does not exceed R . If there is more than one such firm, a selective consumer picks one at random.

The number of captive consumers is determined by the total number of ads, A , that firms send. Let Φ denote the probability that a consumer receives at least one ad. The probability that the consumer is uninformed is then $1 - \Phi = (1 - 1/N)^A \approx e^{-A/N}$ for N large. If a proportion Φ of consumers are to receive some ad, then a total of $A = N \cdot \ln[1/(1 - \Phi)]$ ads must be sent. The social cost of advertising so that a proportion Φ of consumers are not uninformed is thus

$$A(\Phi) = \kappa N \cdot \ln[1/(1 - \Phi)]. \quad (5.1)$$

Each firm chooses which price (or prices) to advertise and the number of ads to send out at each such price. As Butters shows, when the number of firms is finite, firms adopt mixed strategies in any Nash equilibrium. To see the forces at hand, hypothesize an equilibrium in which all firms advertise the same price. If this price were to exceed $c + \kappa$, then a firm could do better by sending the same number of ads but deviating to a slightly lower price. The firm then increases its

tary advertising in perfectly competitive markets.

expected profit, since it wins its selective consumers with probability one. On the other hand, if the candidate equilibrium price is $c + \kappa$ or lower, then a firm earns negative profit, since some recipients are selective and choose a different firm. A firm would do better by sending no ads.

It is possible, however, to describe simply the limiting behavior that obtains when the numbers of firms and consumers are sufficiently large. Each seller is then negligible relative to the market. The behavior of any individual seller is indeterminant, but equilibrium does constrain market behavior. Butters shows that every $P \in [c + \kappa, R]$ must be advertised by some firm and that every such price must generate zero expected profit. For $P \in [c + \kappa, R]$, let $x(P)$ denote the probability that an ad with price P would be accepted by the consumer that receives it. Then $x(P)$ is the probability that a consumer does not receive an ad with a price below P . It follows that $x(P)$ is strictly decreasing. In fact, since every $P \in [c + \kappa, R]$ earns zero profit, $x(P)$ is defined by $(P - c)x(P) - \kappa = 0$. This implies that $x(c + \kappa) = 1 > \kappa/(R - c) = x(R)$.

In effect, $x(P)$ is a downward-sloping demand curve that confronts each firm in equilibrium. The firms compete with one another, but each firm also possesses some monopoly power, due to the informational product differentiation that advertising creates. The demand curve is thus not perfectly elastic. But firms earn zero profit, once the cost of advertising is included. Butters thus offers a first equilibrium model of monopolistic competition with informative advertising.

What are the normative implications? Given that consumers possess identical unit demands, price plays no welfare role. A social inefficiency occurs only if the advertising choice is excessive or inadequate, so that too few or many consumers are uninformed. In the market equilibrium, the probability $x(R)$ that a consumer purchases when the highest possible price is received must equal the probability $1 - \Phi^e$ that the consumer does not receive any other ad. Hence, $1 - \Phi^e = x(R) = \kappa/(R - c)$. Consider now the social planner's choice. When an additional consumer learns of the existence of some firm, the social benefit is $R - c$. But there is also a cost to reaching a previously uninformed consumer. Using (5.1), the advertising cost per-consumer is $A(\Phi)/N = \kappa \cdot \ln[1/(1 - \Phi)]$, which is increasing in Φ . Balancing these considerations, a social planner chooses Φ^* to solve

$$\max_{\Phi} \{\Phi(R - c) - \kappa \cdot \ln[1/(1 - \Phi)]\}.$$

The first-order condition is $R - c - \kappa/(1 - \Phi^*) = 0$, which implies that the market equilibrium level of advertising is socially optimal: $\Phi^e = \Phi^*$.

This is a striking finding. To see the intuition, consider the private benefit to a firm of sending an ad at the price R .⁷³ This benefit equals $(R - c)$ times the probability that the consumer receives no other ad. But this is also the social benefit from sending an ad, since the ad increases social surplus (in amount $R - c$) only when the consumer receives no other ad. Put differently, the highest-priced firm appropriates all consumer surplus and steals no business from rivals; therefore, it advertises at the socially optimal rate. Now consider the private benefit to a firm from sending an ad at a lower price, $P < R$. Such an ad generates consumer surplus that the firm does not appropriate, and it also may steal business. Given that every $P \in [c + \kappa, R]$ earns zero profit, however, the private benefit to a firm from sending an ad is the same whether $P < R$ or $P = R$. Private and social benefits thus agree even for ads with $P < R$.

Butters's model has been extended in many interesting directions. Stegeman (1991) assumes that the numbers of consumers and firms are large, and then modifies Butters's model with the assumption that consumer valuations are heterogeneous. He shows that informative advertising is then inadequate. Intuitively, in equilibrium, the highest-priced firm sets its price strictly below the highest consumer reservation value; therefore, a firm that advertises the highest price no longer captures all of the surplus from the new sales that it creates. Since such a firm does not steal business from any other, it advertises at a socially inadequate rate. Additional ads at lower prices would increase social surplus by at least as much, and so an increase in advertising at any advertised price would increase welfare. Likewise, Stahl (1994) reports that equilibrium advertising is inadequate, when the Butters model with a finite number of firms is extended to allow for downward-sloping individual demand curves (as in the second example above) and general advertising technologies. Stahl shows that the unique mixed-strategy Nash equilibrium is symmetric, and he finds that sellers choose a common advertising level while mixing over prices.

The Butters model also may be extended to allow a more active role for consumers. Suppose that consumers are aware of the existence of firms and seek only price information. This is plausible in an established industry. Ads are one source of price information, but a consumer might also obtain price information through costly search. In comparison to the work described above, an important new feature is that uninformed consumers may search for firms and make purchases. Robert and Stahl (1993) provide an analysis of price advertising in an optimal

⁷³Butters is unable to offer an intuition for his welfare finding. My discussion here draws on Tirole (1988, Section 7.3.2) and Stegeman (1991).

search model.⁷⁴ Assuming that firms make simultaneous advertising and pricing choices, Robert and Stahl characterize a unique and symmetric price-dispersion equilibrium, in which a firm either charges a high price that is not advertised or selects from an interval of lower prices that are advertised. The high price may be interpreted as a “list price.” Firms that charge this price sell only to uninformed consumers, and the list price is set at a level that dissuades such consumers from further search. In the interval of advertised “sales,” an interesting prediction is that advertising intensity is greater at lower prices. Intuitively, the marginal benefit of advertising is greater at lower prices, since such prices are more likely to attract the recipient (who may be selective).⁷⁵

Interesting findings also arise when the model is extended to allow for sequential choices. McAfee (1994) posits that firms first choose their advertising rates and then choose their prices. A firm’s advertising rate determines the probability that a consumer obtains its price offer. An asymmetric equilibrium then exists, wherein one firm advertises more than do other firms, who all advertise equally. Prices are mixed, and now the firm with the higher advertising rate charges *higher* prices (in the sense of first-order stochastic dominance). The reason is that such a firm has a greater stock of captive consumers. Roy (2000) also considers a sequential-choice game, and he allows further that firms may “target” the individual consumers to whom their respective ads are delivered.⁷⁶ Working with a duopoly model, he finds that the two firms divide the entire market into mutually exclusive captive segments within which each firm operates as a local monopolist. Under the assumption that consumers have identical unit demands, the resulting equilibria are socially efficient: firms appropriate all consumer surplus by pricing at R , and the social cost of informing consumers is minimized (every consumer receives exactly one ad).

⁷⁴Butters considers an extended model with search, but he does not analyze optimal search.

⁷⁵Bester (1994) conducts a related analysis in a monopoly model. Consumers must sink a search cost in order to visit the monopolist’s store, and the monopolist thus seeks a device through which to commit to low prices. Price advertising is such a device. A mixed-strategy equilibrium is constructed, in which the monopolist advertises only low prices. Modifying the model to allow that the monopolist is privately informed as to its costs of production, Caminal (1996) constructs a pure-strategy equilibrium, in which the monopolist advertises low prices when its costs are low.

⁷⁶For other studies of targeted advertising, see Adams and Yellen (1977), Esteban, Gil and Hernandez (2001), Esteban, Hernandez and Moraga-Gonzalez (2001) and Hernandez-Garcia (1997). The related possibility of coupon targeting is considered by Bester and Petrakis (1996), Moraga-Gonzalez and Petrakis (1999) and Shaffer and Zhang (1995), for example.

5.2. Differentiated Products

Grossman and Shapiro (1984) extend the Butters model to include horizontal product differentiation. In their model, firms are located around a circle, and the number of firms may be endogenous. Following Tirole (1988, Section 7.3.2), I focus here on a duopoly model in which firms are located on a line. Even when simplified in this way, the Grossman-Shapiro model offers novel insights, and at the same time provides a unified framework within which to interpret a broad range of issues that arise in earlier writings and empirical efforts.

Consider then the following model. A unit mass of consumers are uniformly distributed along a line of unit length. Each consumer has reservation value R for a single unit of an ideal product, and suffers a transportation cost t per unit of distance from the ideal. There are two firms, located at opposite endpoints. Advertising operates as in Butters's model: a consumer can learn of a firm's existence and price only by receiving an ad from that firm, and each ad is distributed randomly over consumers. The cost of reaching a fraction Φ_i of consumers is denoted $A(\Phi_i)$. Grossman and Shapiro allow for general advertising technologies (of which the Butters's technology given in (5.1) is a special case), and I specify here a quadratic relationship: $A(\Phi_i) = a(\Phi_i)^2/2$, where $a > t/2$.

There are again three kinds of consumers. If firms 1 and 2 advertise at levels so that fractions Φ_1 and Φ_2 of consumers are reached, respectively, then a fraction $[1 - \Phi_1][1 - \Phi_2]$ of consumers receive no ad and are uninformed. A fraction $\Phi_1[1 - \Phi_2]$ receive only firm 1's ads and are thus captive to firm 1; likewise, a fraction $\Phi_2[1 - \Phi_1]$ are captive to firm 2. Finally, a fraction $\Phi_1\Phi_2$ consumers receive ads from both firms and are thus selective. Suppose that R is sufficiently large that a consumer purchases if any ad is received. Suppose also that the number of selective consumers is of sufficient size that the firms compete for this common demand. This is the case if the cost of advertising is not too great.

What demand function does firm 1 confront? If the firms choose prices P_1 and P_2 , respectively, then the marginal selective consumer is located at $x = (P_2 - P_1 + t)/2t$. When a firm chooses its advertising expenditure, it equivalently chooses its reach. Firm 1's demand function thus may be written as follows:

$$D_1(P_1, P_2, \Phi_1, \Phi_2) = \Phi_1[(1 - \Phi_2) + \Phi_2(P_2 - P_1 + t)/2t].$$

The informative view holds that a firm faces a more price-elastic demand in markets with greater advertising. This elasticity effect is confirmed here. Firm 1's elasticity of demand when evaluated at $P_1 = P_2 = P$ and $\Phi_1 = \Phi_2 = \Phi$ is easily

shown to be $[\Phi P/(2 - \Phi)t]$, which is increasing in Φ and thus in the market level of advertising.

Consider now a game in which the two firms simultaneously choose their prices and advertising levels. If the marginal costs of production are constant, firm 1 thus chooses P_1 and Φ_1 to maximize $[P_1 - c]D_1(P_1, P_2, \Phi_1, \Phi_2) - A(\Phi_1)$. It is now straightforward to derive price and advertising reaction curves and then solve for a symmetric equilibrium, $P_1^e = P_2^e = P^e$ and $\Phi_1^e = \Phi_2^e = \Phi^e$. The equilibrium is characterized as follows:

$$P^e = c + t \cdot \frac{2 - \Phi^e}{\Phi^e} = c + \sqrt{2at}, \quad (5.2)$$

$$\Phi^e = \frac{2}{1 + \sqrt{2a/t}}, \quad (5.3)$$

$$\Pi^e = \frac{2a}{(1 + \sqrt{2a/t})^2}, \quad (5.4)$$

where Π^e is the equilibrium profit earned by a single firm.

At a positive level, these equations yield a number of important implications. Consider first the equilibrium price. As (5.2) reveals, it is higher than $c + t$, which is the price that would emerge were consumers informed of all prices. The reason is that demand is less elastic in the presence of informational product differentiation. This does not mean that advertising increases prices; indeed, the market would close in the absence of advertising. As Stigler (1961) and Ozga (1960) suggest, consumer ignorance leads to higher prices, while advertising provides information and lowers prices. This may be confirmed by noting that the equilibrium price falls when the cost of advertising falls (i.e., when a decreases). Second, using (5.3), the equilibrium advertising level is higher when advertising is less costly and when products are more differentiated (i.e., when t is greater). The latter effect suggests that greater product differentiation leads to more advertising. This contrasts with the empirical interpretations offered by Comanor and Wilson (1967, 1974), who posit that advertising induces product differentiation. In the Grossman-Shapiro model, where advertising is endogenized, product differentiation induces advertising.

As (5.4) shows, equilibrium profit is increasing in product differentiation and, more surprisingly, the cost of advertising. When a increases, the direct effect is that each firm experiences a cost increase, but the resulting decrease in advertising also gives rise to a strategic effect: each firm faces a less elastic demand and

thus charges a higher price. The strategic effect dominates here, and firms benefit overall when advertising is more costly (but not prohibitively so). This finding provides a formal interpretation of work by Benham (1972) and others (see Section 3.2.4) suggesting that some professions encourage legal restrictions on advertising.⁷⁷ It also offers a formal interpretation of the profit-advertising relationship described by Comanor and Wilson (1967, 1974) and others (see Section 3.2.2). In the Grossman-Shapiro model, advertising does not cause profit, nor does profit cause advertising. Instead, as (5.3) and (5.4) confirm, advertising and profit are both endogenous variables that are jointly determined from exogenous variables corresponding to the extent of product differentiation and the cost of advertising. In a given sample of industries, as the extent of product differentiation varies, advertising and profit move together; however, as the cost of advertising varies, advertising and profit may move in opposite directions. From this perspective, the sign of an observed correlation between advertising and profit simply reflects which of the exogenous variables varies most in the sample at hand.

The key normative finding is that market advertising may be inadequate or excessive.⁷⁸ To understand the various effects, consider first additional advertising by a firm that reaches a consumer who otherwise would be uninformed. The social benefit of such advertising exceeds the private benefit, since the firm is unable to appropriate the resulting consumer surplus. This suggests that market advertising is inadequate. Consider next the effect of additional advertising by a firm that reaches a consumer that also receives an ad from the other firm. Social surplus is created if the consumer is located closer to the firm that undertakes the additional advertising. The advertising firm does not internalize this matching benefit, and so the matching effect also suggests that market advertising is inadequate. But the firm is motivated by the profit margin that it would enjoy on the “stolen” consumer, while social welfare is not impacted by the re-distribution of margins from one firm to another. This business-stealing externality parallels Marshall’s (1919) notion of combative advertising and suggests that the market advertising may be excessive.

Bester and Petrakis (1995) offer an interesting extension. In their model, consumers live in one of two regions, where each region has a single firm. All

⁷⁷But see also Peters (1984), who considers a model in which firms sell a homogeneous good, face capacity constraints, and are privately informed as to their respective costs of production. He argues that advertising restrictions may benefit high-cost (harm low-cost) producers, and it can happen that prices are lower when advertising is restricted. See also LeBlanc (1998).

⁷⁸See Tirole (1988, p. 294) for a formal confirmation of this finding.

consumers are informed of the existence of both firms, and every consumer also knows the price of the “local” firm. A consumer forms an expectation as to the price charged by the distant firm, and a consumer learns the actual price if an ad is received from the distant firm. In this setting, Bester and Petrakis characterize a symmetric mixed-strategy equilibrium. Their findings share features with those of Robert and Stahl and also Grossman and Shapiro. In equilibrium, with some probability a firm posts a “list price” and attracts only local consumers and with the remaining probability a firm advertises a low “sale” price and tries to attract distant consumers.⁷⁹ Moreover, firms gain from an increase in the cost of advertising, and market advertising may be inadequate or excessive.

Finally, Rogerson (1988) considers a model in which firms advertise prices and also select product qualities. Each consumer observes the advertised prices, selects a firm, observes the product quality offered by this firm, and then decides whether to purchase or engage in sequential search. Consumers have heterogeneous search costs and differ also in their willingness to pay for quality. Rogerson characterizes a monopolistically competitive equilibrium, in which firms that offer higher-quality products also enjoy larger markups. Consumers infer quality from the advertised price, and those that are more willing to pay for quality select firms that advertise higher prices. Intuitively, a firm will not “rip off” its consumers with a lower quality, if the implied cost savings on those consumers that remain would be small in comparison to the markup that would be lost on those consumers that search again. At higher quality, the potential cost savings are greater, and a higher markup is needed to dissuade the firm from cheating. With U-shaped average costs and a zero-profit requirement, larger markups must be paired with lower sales; thus, Rogerson finds that higher-quality firms are smaller. Rogerson also examines a no-advertising benchmark, finding that social welfare is higher when advertising is allowed.

5.3. Non-Price Advertising

Bagwell and Ramey (1994a) emphasize two features of the modern retail market. First, in many retail categories, large-scale discount firms co-exist with small firms, and the large firms share a common set of attributes: high sales volumes, heavy advertising expenditures, low prices and large investments in advanced sell-

⁷⁹See also Bester (1994) and Caminal (1996), as discussed in footnote 75.

ing technologies.⁸⁰ Second, competition between retail firms often occurs through non-price advertising. The typical TV or radio retail ad, for example, contains little or no direct (“hard”) information. Motivated by these features, Bagwell and Ramey develop a new model of the retail firm and offer an equilibrium interpretation of non-price advertising by retailers.

The retail-firm model is easily described with reference to a monopolist that expects $N > 0$ consumers, where each consumer possesses the positive and downward-sloping individual demand function, $d(P)$. The monopolist chooses a price $P \geq 0$ and a level of investment $K \geq 0$. The cost of investment is $r > 0$ per unit, and the benefit of greater investment is that the marginal cost of selling is thereby reduced: $c'(K) < 0$. The firm’s net revenue is thus $R(P, K, N) \equiv [P - c(K)]Nd(P) - rK$. For given N , let $P_M(N)$ and $K_M(N)$ be the price and investment levels that jointly maximize R . Assuming that second-order conditions are satisfied, these monopoly values satisfy $R_P = R_K = 0$. Let $\Pi^*(N) \equiv R(P_M(N), K_M(N), N)$ denote the maximized value of net revenue.

Bagwell and Ramey establish a “coordination economy” that is enjoyed by a firm and its consumers when the firm gets larger. First, using a standard envelope argument, it follows that a firm does better when it expects more consumers: $\Pi^{*'}(N) > 0$. Second, a consumer also does better when a firm expects more consumers. To see this, observe that $R_{PN} = 0$ at the monopoly values (since $R_P = 0$), $R_{KN} = -c'd > 0$ and $R_{KP} = -c'Nd' < 0$. It follows that $K'_M(N) > 0$ and $P'_M(N) < 0$: a monopolist invests more and prices lower when more consumers are expected. Intuitively, an investment that reduces marginal cost is more attractive when a higher sales volume is anticipated, and the reduction in marginal cost in turn makes a lower price more attractive.

At a general level, it is now possible to anticipate a role for non-price advertising. Imagine that consumers do not observe the firm’s price until after a search cost is incurred. Consumers do, however, observe the firm’s non-price advertising. Suppose now that advertising attracts consumers: $N'(A) > 0$. Then, a higher advertising level leads to greater expected sales, which in turn induces greater investment and thereby a lower price. Therefore, if it is supposed that consumers respond to advertising, then a firm that advertises heavily also adopts a low price,

⁸⁰Advanced selling technologies include advanced information systems (electronic-scanner checkout systems, privately owned satellites) and superior delivery systems (privately owned warehouses and trucks). Bagwell and Ramey (1994a) observe, too, that large firms offer greater product variety, and their retail-firm model accounts for this attribute as well. I present a simplified single-product model below.

and so the supposed responsiveness of consumers to advertising becomes justified. From this perspective, it is entirely rational for consumers to respond to non-price advertising. This conclusion holds as well in multi-firm markets, if a firm expects greater market share when it advertises more heavily.

To go further, an equilibrium model of retail advertising is required. Consider a three-stage game. In the first stage, firms decide whether to enter. Entry entails a sunk cost, $\sigma > 0$. In the second stage, the firms simultaneously make price, investment and advertising selections. Finally, in the third stage, each consumer picks a firm from which to buy, based on the information that the consumer possesses. There are two kinds of consumers. Informed consumers observe the firm that makes the greatest advertising expenditure. Uninformed consumers do not observe advertising efforts. There is a unit mass of consumers in total. Let I and U denote the exogenous proportions of informed and uninformed consumers, respectively, where $I + U = 1$ and $U \in (0, 1)$. No consumer observes a firm's price and investment selections prior to picking a firm. The firms thus select their monopoly price and investment levels, given the number of consumers that they respectively expect.

As a benchmark, consider the *random equilibrium* that obtains when consumers are not responsive to advertising and thus pick firms at random. Entering firms then choose zero advertising and divide the market. Thus, if n firms enter, each firm expects $N = 1/n$ consumers. Ignoring integer constraints, the equilibrium number of firms is the value n_r that satisfies $\Pi^*(1/n_r) = \sigma$. Each firm adopts the price $P_M(1/n_r)$.

Now consider an *advertising equilibrium*, in which informed consumers adopt the rule of buying from the firm that advertises the most. As Bagwell and Ramey show, for any $n \geq 2$, a mixed-strategy equilibrium is induced. This equilibrium is characterized by a distribution function $F(A)$ that ensures for each firm that the higher cost of additional advertising is balanced against the benefit of a higher expected sales volume. In an advertising equilibrium, when a firm advertises at level A , it expects to win the informed consumers with probability $F(A)^{n-1}$. Therefore, when a firm advertises at level A , it expects $N(A) = F(A)^{n-1}I + U/n$ consumers, which is indeed an increasing function. The distribution function is formally defined by $\Pi^*(F(A)^{n-1}I + U/n) - \kappa A = \Pi^*(U/n)$, where $\Pi^*(U/n)$ is the profit that is enjoyed by a firm that chooses zero advertising. Observe that the simple rule used by informed consumers is rational. When a firm advertises at level A , it sets the price $P_M(F(A)^{n-1}I + U/n)$, and so higher-advertising firms indeed offer lower prices. This is consistent with the general discussion above. Finally,

ignoring integer constraints, entry occurs until expected profit is zero. Since a firm is indifferent over all advertising selections in the support, the equilibrium number of firms is the value n_a that generates zero profit when a firm selects zero advertising: $\Pi^*(U/n_a) = \sigma$.

The random equilibrium would obtain, for example, if advertising were prohibited, while the advertising equilibrium might be predicted when advertising is legal. It is thus interesting to compare these two equilibria. Observe first that the market with advertising has fewer firms that are on average larger: $n_r > n_a$. This observation follows, since $\Pi^*(1/n_r) = \sigma = \Pi^*(U/n_a)$ and $\Pi^{*'} > 0$ imply that $1/n_r = U/n_a$. Observe second that, with probability one, in a market with advertising every firm offers a lower price than in a market without advertising. To see this, observe that the highest possible price in the advertising equilibrium occurs when a firm does not advertise, and the price then charged equals the price that is always offered in the random equilibrium: $P_M(U/n_a) = P_M(1/n_r)$. Therefore, expected consumer welfare is higher when advertising is allowed. Since firms make zero expected profit either way, social welfare is higher when advertising is allowed than when it is not.

Bagwell and Ramey capture and build upon a number of themes from earlier work. In line with Chamberlin's (1933) work, they construct a monopolistically competitive equilibrium, in which profits are dissipated through advertising expenditures, and advertising operates through a scale effect to facilitate lower prices. But the scale effect that they utilize is a "long-run" effect, under which greater expected sales volume leads to additional cost-reducing investments.⁸¹ In addition, their advertising equilibrium exhibits endogenous firm heterogeneity: some firms advertise heavily, enjoy high expected sales, choose low prices and make large investments, while other firms advertise less but expect low sales and set high prices while making small investments. Bagwell and Ramey also provide a formalization of Nelson's (1974b) signaling-efficiency effect. In particular, they find that a choice of heavy advertising is paired with a selection of large investment, and so rational consumers indeed can use ostensibly uninformative advertising expenditures as an indication of low costs and thus low prices. Finally, they offer an equilibrium interpretation for the empirical finding of Benham (1972) and others (see Section 3.2.4) that the introduction of even non-price advertising leads to the entry of large-scale firms and lower prices.

⁸¹Bagwell and Ramey show that a short-run scale effect, corresponding to marginal costs that decline with output, would reinforce their findings. Declining marginal costs may be relevant when large retailers receive quantity discounts.

Bagwell and Ramey (1994b) offer an alternative formulation. In a first model, where one firm is known to be more efficient than a second, they show that the possibility of advertising ensures that all consumers coordinate on the efficient firm. If another equilibrium were posited, then the efficient firm could break this equilibrium by advertising heavily. Sophisticated consumers would understand that the efficient firm could then possibly profit, only if it were to receive a large number of consumers and price at the associated low monopoly price. Advertising is not required on the equilibrium path, though, once consumers are coordinated on the efficient firm. In a second model, a firm is privately informed as to whether it is more efficient than its rival. In the (refined) separating equilibrium, when this firm is more efficient, it advertises a positive amount on the equilibrium path, in order to signal its low costs and the associated low monopoly price. This prediction confirms Nelson’s (1974b) signaling-efficiency effect, when a firm’s level of efficiency is exogenous and privately known.

In the Bagwell-Ramey (1994a,b) models, a consumer desires to visit a firm that expects a large number of other consumers. In this sense, an “indirect” network externality exists between consumers. Chwe (2001), Clark and Horstmann (2001) and Pastine and Pastine (2002) consider the related but distinct possibility of a “direct” network externality among consumers, whereby a consumer enjoys the social prestige that is associated with purchasing from a firm that actually sells to a large number of other consumers.⁸² Under both approaches, advertising may promote improved coordination and welfare gains.

5.4. Loss Leaders

The discussion above emphasizes extreme cases, in which a firm can advertise all or none of the prices of its products. In many categories, retailers carry thousands of items, and it is clearly not realistic to assume that all prices can be meaningfully advertised. As mentioned in Section 3.2.4, however, a firm may then advertise the price of particular “loss-leader” products.

I describe here the “commitment” and “signaling” theories of loss-leader pricing. The commitment theory is advanced by Lal and Matutes (1994).⁸³ In their model, one firm is located at each endpoint of the Hotelling line, each firm offers two products, consumers observe an advertised price at zero cost, and consumers

⁸²For further discussion of research on network externalities, see the contribution to this volume by Farrell and Klemperer.

⁸³See also Wernerfelt (1994). Gerstner and Hess (1990) and Hess and Gerstner (1987) offer related analyses that feature loss-leader pricing, bait-and-switch tactics and rain checks.

must pay a search cost to observe an unadvertised price. Except for their locations, consumers are identical and have independent unit demands for both goods. For simplicity, suppose that consumers have a common reservation price R for each good and that it is possible to advertise the price of just one product. A firm then faces a commitment problem: it is unable to credibly promise that it will charge a price below R on an unadvertised good. In the absence of advertising, therefore, consumers would foresee that all products are priced at R and choose not to visit any firm, thus saving the search cost. In the presence of advertising, however, a firm can use an advertised loss-leader price to guarantee sufficient consumer surplus to justify costly search, even though the unadvertised good is priced at R . Notice that consumers rationally expect that the price of the unadvertised product is independent of the advertised loss-leader price.⁸⁴

Lal and Narasimhan (1996) extend the commitment theory to include a preceding stage in which the manufacturer of the loss-leader good selects a wholesale price and a level of advertising. Manufacturer advertising raises the demand for the manufacturer's good; specifically, it increases the reservation value that consumers have for a second unit of the loss-leader good. Lal and Narasimhan argue that manufacturer advertising may lower the retail price and raise the wholesale price of the loss-leader good, so that the retail margin is reduced and the wholesale margin is increased. This theory provides a formal foundation for work by Steiner (1973, 1978, 1984, 1993) and others, as discussed in Section 3.2.4.

Building on Nelson's (1974b) signaling-efficiency effect, the signaling theory holds that a firm uses an advertised low price to signal low costs. Consumers then rationally expect the price of the unadvertised product to be relatively low as well. Bagwell (1987) offers a formalization of this general idea. He considers a two-period model, in which demand is downward-sloping, consumers must pay a search cost to observe the current price and a firm is privately informed as to whether its costs are high or low. A low-cost firm may signal its costs with an "introductory sale." The firm then obtains greater repeat business, since consumers rationally expect the firm to charge a low price in the future. As Bagwell (1987, p. 384) notes, his two-period, single-good model may be reinterpreted as a single-period, two-good model, in which an advertised loss-leader price signals low costs and thus a low price on the unadvertised product. Simester (1995) develops this loss-leader model in detail and records a number of interesting predictions.⁸⁵

⁸⁴In their contribution to this volume, Farrell and Klemperer discuss a related "bargains-then-ripoffs" theme that arises in dynamic models with switching costs.

⁸⁵See also Bagwell and Ramey (1994b). They provide an extended model in which loss-leader

5.5. Summary

The multi-firm models described above yield a striking set of predictions. Some of these predictions confirm and extend ideas found in earlier writings. The formal models also offer a number of new predictions. At a normative level, this work offers support for the presumption that retail markets perform better when advertising is possible. This is true for both price and non-price advertising. At the same time, there is no presumption that the level of advertising is optimal. As in the normative theory of monopoly advertising, inadequate advertising may arise, since a firm does not internalize the consumer surplus that an additional ad may generate. Furthermore, when there are multiple firms, excessive advertising may occur, since a firm privately benefits from the sale that an additional ad may generate, even when this sale is “stolen” from another firm and offers no or modest social benefit. Finally, in many retail categories, large retailers sell thousands of products. The amount of direct price information that advertising can convey is then necessarily limited. Important future work might consider further the role of price and non-price advertising activities by multi-product retailers.

6. Advertising and Quality

Nelson (1974b) predicts a positive relationship between advertising and product quality, especially for experience goods. In support of this prediction, he identifies the signaling-efficiency, repeat-business and match-products-to-buyers effects. As discussed in Section 3.2.5, however, the empirical literature offers mixed support for this prediction. I consider now recent theoretical analyses of advertising and quality. I organize this discussion around the three effects that Nelson (1974b) identifies. The signaling-efficiency effect is formalized using a static model. A related dynamic model is then presented, so that the repeat-business effect may be examined. This is followed by a short discussion of the match-products-to-buyers effect. Finally, I also discuss research that considers advertising in the context of the quality-guarantee effect.

6.1. Signaling-Efficiency Effect

Nelson (1974b) argues that demand expansion is most attractive to efficient firms. Such firms may enhance demand by advertising heavily, setting low prices and

pricing is used to ensure that consumers coordinate on the most efficient firm.

providing high quality; consequently, consumers may draw inferences as to the deal that a firm offers after observing its advertising. Above, I discuss the manner in which observed advertising may signal efficiency and thereby price for a retailer that offers search goods. I consider now how observed advertising and price may signal efficiency and thereby the (exogenous) quality of an experience good. This analysis may be most relevant for the manufacturer of a new product.

My approach is to draw on techniques developed by Bagwell and Ramey (1988) for signaling games with multiple signals. They analyze price and advertising as signals of cost in an entry-deterrence model (see Section 7.2 below). As Bagwell (1992) and Overgaard (1991) observe, these techniques also can be used to analyze how a high-quality monopolist best uses multiple signals to signal its quality.⁸⁶ In particular, Overgaard examines the static model that I now summarize.⁸⁷

Formally, suppose a monopolist privately observes whether its product-quality type is low or high, $t \in \{L, H\}$, and then selects a price $P \geq 0$ and an advertising level $A \geq 0$. Consumers observe P and A , form some belief $b = b(P, A) \in [0, 1]$ as to the likelihood of high quality, and then demand $D(P, A, b) > 0$ units, where $D_P < 0 < D_b$ and $D_A \geq 0$. Advertising may be dissipative ($D_A = 0$), or it may contain information and/or induce social prestige and thus be demand-enhancing ($D_A > 0$). Let $c(t)$ denote the constant marginal cost of production when quality is type t . If $c(H) < c(L)$, then the high-quality monopolist is also the efficient (low-cost) monopolist. This is the case to which Nelson's (1974b) signaling-efficiency effect refers. As Schmalensee (1978) emphasizes, however, it may be more plausible to assume that a high-quality product has a higher marginal cost: $c(H) > c(L)$. Both cases are considered here.⁸⁸

A monopolist of type t makes profit $\Pi(P, A, b, t) \equiv (P - c(t))D(P, A, b) - \kappa A$. For fixed t and b , assume $\Pi(P, A, b, t)$ has unique maximizers, $P_m(t, b)$ and $A_m(t, b)$, and is strictly concave in P . In the complete-information bench-

⁸⁶Here and in Section 7.2 below, I illustrate these techniques using a simple Lagrangian argument. A more general treatment is available in the original papers.

⁸⁷See also Zhao (2000), who places additional structure on the demand function and derives a related set of findings. For models in which a high-quality monopolist signals its quality using only price, see Bagwell and Riordan (1991) and Bagwell (1991). Under the assumption that a higher-quality product entails a higher marginal cost, they show that the high-quality monopolist adopts a high (supra-monopoly) price. This prediction is maintained below, when the model is expanded to include advertising as a signal.

⁸⁸While it is plausible that unit costs tend to be higher for higher-quality products, this relationship may fail if higher-quality products achieve greater market share and thereby enjoy scale economies. Phillips, Chang and Buzzell (1983) use PIMS data and report that businesses with higher relative quality often have higher market shares and lower relative unit costs.

mark, the monopoly selections are $(P_M(H), A_M(H)) \equiv (P_m(H, 1), A_m(H, 1))$ and $(P_M(L), A_M(L)) \equiv (P_m(L, 0), A_m(L, 0))$. The complete-information monopoly profits are $\pi_M(H) = \Pi(P_M(H), A_M(H), 1, H)$ and $\pi_M(L) = \Pi(P_M(L), A_M(L), 0, L)$. Assume $\pi_M(t) > 0$ for $t \in \{L, H\}$, so that both quality types are profitable.

A *Perfect Bayesian Equilibrium* is a set of strategies, $\{P(t), A(t)\}_{t=L,H}$, and beliefs, $b(P, A)$, such that: (i) for each $t \in \{L, H\}$, $(P(t), A(t))$ maximizes $\Pi(P, A, b(P, A), t)$, and (ii) $b(P, A)$ is derived from the equilibrium strategies using Bayes' rule whenever possible. I focus here on *separating equilibria*, in which $(P(H), A(H)) \neq (P(L), A(L))$ and thus $b(P(H), A(H)) = 1 > 0 = b(P(L), A(L))$. In a separating equilibrium, the low-quality monopolist is "found out." It can do no better than to make its complete-information selections, $(P(L), A(L)) = (P_M(L), A_M(L))$, and earn the corresponding profit, $\pi_M(L)$.⁸⁹ Thus, if the high-quality monopolist is to separate, then it must choose some pair (P, A) that the low-quality monopolist would not mimic:

$$\Pi(P, A, 1, L) \leq \pi_M(L). \quad (6.1)$$

To make the problem interesting, assume that signaling is costly for the high-quality monopolist: $(P_M(H), A_M(H))$ does not satisfy (6.1).

In the *least-cost separating equilibrium*, the high-quality monopolist separates in the way that it finds most profitable. The least-cost separating equilibrium is of particular interest, and it is also selected when standard refinements are employed. Formally, define (P^*, A^*) as the price-advertising pair that solves

$$\underset{P,A}{Max} \Pi(P, A, 1, H) \text{ subject to (6.1)}. \quad (6.2)$$

In a least-cost separating equilibrium, $(P(H), A(H)) = (P^*, A^*)$. Following arguments by Bagwell (1992) and Overgaard (1991), the existence of the least-cost separating equilibrium may be established. Here, I focus on the characterization of this equilibrium.

To gain some intuition, consider any two price-advertising pairs, (P_1, A_1) and (P_2, A_2) , that yield the same profit for a mimicking low-quality monopolist:

⁸⁹Suppose $(P(L), A(L)) \neq (P_M(L), A_M(L))$. Then the low-quality monopolist could deviate to $(P_M(L), A_M(L))$ and earn strictly higher profit, since

$$\Pi(P(L), A(L), 0, L) < \Pi(P_M(L), A_M(L), 0, L) \leq \Pi(P_M(L), A_M(L), b(\cdot), L)$$

where $b(\cdot) \equiv b(P_M(L), A_M(L))$. The final inequality follows since $D_b > 0$ and $\pi_M(L) > 0$, with the latter implying that $P_M(L) > c(L)$.

$\Pi(P_1, A_1, 1, L) = \Pi(P_2, A_2, 1, L)$. Observe that

$$\begin{aligned} & \Pi(P_2, A_2, 1, H) - \Pi(P_1, A_1, 1, H) \\ &= [\Pi(P_2, A_2, 1, H) - \Pi(P_1, A_1, 1, H)] - [\Pi(P_2, A_2, 1, L) - \Pi(P_1, A_1, 1, L)] \\ &= [c(H) - c(L)][D(P_1, A_1, 1) - D(P_2, A_2, 1)]. \end{aligned} \quad (6.3)$$

Suppose that $c(H) > c(L)$, and consider a change from (P_1, A_1) to (P_2, A_2) that leaves the low-quality monopolist indifferent. According to (6.3), if demand is lower at the new price-advertising pair, then the high-quality monopolist gains from the change. The key idea is that demand-reducing changes are more attractive to the high-quality monopolist when marginal costs increase with quality, since the demand reduction then offers a greater cost savings. Similarly, if $c(H) < c(L)$, then a change that leaves the mimicking low-quality monopolist indifferent and enhances demand is preferred by the high-quality monopolist.

Further insight may be gained by analyzing the program given in (6.2). The Lagrangian is $L(P, A, \lambda) \equiv \Pi(P, A, 1, H) + \lambda[\pi_M(L) - \Pi(P, A, 1, L)]$. Using (6.3), it may be verified that $\lambda \in (0, 1)$ at the optimum.⁹⁰ The Lagrangian may be rewritten as

$$L(P, A, \lambda) = (1 - \lambda)\left\{ \left(P - \frac{c(H) - \lambda c(L)}{1 - \lambda} \right) D(P, A, 1) - \kappa A \right\} + \lambda \pi_M(L). \quad (6.4)$$

As the bracketed term in (6.4) reveals, in the least-cost separating equilibrium, the high-quality monopolist makes the same price-advertising selection as it would

⁹⁰The costly-signaling assumption implies that $\lambda > 0$. Given A^* , the first-order condition $L_P = 0$ determines P^* as the solution to

$$\Pi_P(P, A^*, 1, H) - \Pi_P(P, A^*, 1, L) = (\lambda - 1)\Pi_P(P, A^*, 1, L)$$

Take the case in which $c(H) > c(L)$. The left-hand side is then positive. Consider the right-hand side. Let $\tilde{P}_m(t)$ maximize $\Pi(P, A^*, 1, t)$. Suppose first that $P^* < \tilde{P}_m(L)$. Then let $(P_1, A_1) = (P^*, A^*)$ and $(P_2, A_2) = (\bar{P}^*, A^*)$, where $\bar{P}^* > \tilde{P}_m(L)$ satisfies $\Pi(P^*, A^*, 1, L) = \Pi(\bar{P}^*, A^*, 1, L)$. $\bar{P}^* > P^*$ implies $D(P^*, A^*, 1) > D(\bar{P}^*, A^*, 1)$. Using $c(H) > c(L)$ and (6.3), the high-quality monopolist strictly prefers (\bar{P}^*, A^*) , which contradicts that (P^*, A^*) solves (6.2). Suppose second that $P^* = \tilde{P}_m(L)$. It follows from $c(H) > c(L)$ that $\tilde{P}_m(L) < \tilde{P}_m(H)$. Starting at (P^*, A^*) , consider a small price increase, so that the new pair, $(P^* + \varepsilon, A^*)$, satisfies $P^* + \varepsilon \leq \tilde{P}_m(H)$. Given the strict concavity of profit in price, the high-quality (low-quality) monopolist strictly prefers the new (old) pair, and again a contradiction is reached. It must be that $P^* > \tilde{P}_m(L)$. This implies that $\Pi_P(P, A^*, 1, L) < 0$ at P^* ; hence, the right-hand side is positive if and only if $\lambda < 1$. A similar argument applies when $c(H) < c(L)$.

were it to produce at constant marginal cost $c_o \equiv [c(H) - \lambda c(L)] / (1 - \lambda)$ and offer a product of known high quality. Observe that $\lambda \in (0, 1)$ implies $\text{sign}\{c_o - c(H)\} = \text{sign}\{c(H) - c(L)\}$.

Consider first the case in which a high-quality product entails a greater marginal cost: $c(H) > c(L)$. In the least-cost separating equilibrium, the high-quality monopolist then undertakes a “cost-increasing distortion,” in that it sets the same price-advertising pair as it would were its quality known but its marginal costs higher ($c_o > c(H)$). It is natural to assume that under complete information a monopolist would choose a higher price and less demand-enhancing advertising were its constant marginal costs increased.⁹¹ Under this assumption, in the least-cost separating equilibrium, the high-quality monopolist distorts its price upward ($P^* > P_M(H)$) and its demand-enhancing advertising downward ($A^* < A_M(H)$). A high-quality monopolist thus best signals its quality with a high price and a low level of demand-enhancing advertising. In essence, the high-quality monopolist is signaling that it has high costs and is willing to reduce demand.

Consider second the case in which a high-quality product entails a lower marginal cost: $c(H) < c(L)$. Then, in the least-cost separating equilibrium, the high-quality monopolist undertakes a “cost-reducing distortion” ($c_o < c(H)$). The result is a downward pricing distortion ($P^* < P_M(H)$) and an upward distortion in the level of demand-enhancing advertising ($A^* > A_M(H)$). As Nelson (1974b) predicts, the high-quality monopolist best signals its quality with a low price and high level of demand-enhancing advertising. Fundamentally, the high-quality monopolist is signaling that it has low costs and welcomes an expansion in demand.

What if advertising is dissipative? Whether marginal cost rises or falls with product quality, dissipative advertising would not be used by a monopolist with a known high-quality product; thus, such advertising is not used as a signal.⁹² In this model, advertising is used as a signal of quality only if it is demand-enhancing.

While the model is static, the findings suggest a dynamic perspective. In particular, once the monopolist’s product is sufficiently mature, consumers are presumably informed about its quality, and so the high-quality monopolist then sets its price and advertising at their complete-information levels ($P_M(H)$ and $A_M(H)$). Over the long run, the model thus predicts that the high-quality prod-

⁹¹For instance, it may be verified that this assumption is satisfied when demand is described by either of the two examples considered in Section 4.1.2.

⁹²Formally, if advertising is dissipative, then $L_A(P, A, \lambda) = \kappa[\lambda - 1] < 0$, where the inequality follows since $\lambda < 1$ (as shown in footnote 90). Thus, when advertising is dissipative, it is optimally set at a boundary: $A^* = 0$.

uct’s price declines and its demand-enhancing advertising increases, if marginal cost rises with quality. The opposite prediction (rising price, declining advertising) applies when marginal cost falls with quality. Whether its product is new or mature, the monopolist would never use dissipative advertising.

A further prediction is that the correlation between advertising and quality fluctuates across market settings. Suppose that marginal cost rises with quality and consider a new product. Relative to the complete-information benchmark, a high-quality monopolist distorts its advertising downward ($A(H) = A^* < A_M(H)$), while a low-quality monopolist does not distort its advertising ($A(L) = A_M(L)$). But it is not clear whether the level of complete-information advertising is greater when quality is high or low. Intuitively, complete-information advertising is expected to be greater when quality is high, if marginal cost rises slowly with quality and the marginal impact of advertising on demand rises quickly with quality. Pulling these themes together, it is possible that the advertising-quality correlation is positive under complete information and thus for a mature product, and yet the correlation is negative for a new product ($A^* < A_M(L) < A_M(H)$).⁹³ More generally, when $c(H) > c(L)$, the advertising-quality correlation is stronger (more positive, less negative) for a mature product. These findings offer a possible interpretation for empirical efforts (see Section 3.2.5) that report a generally weak advertising-quality correlation that is stronger for established products.

The model may be extended to consider a monopolist of intermediate age, so that some but not all consumers are informed of quality. If ζ represents the fraction of uninformed consumers, then the profit for a monopolist now depends upon its type through its marginal cost *and* the demand of informed consumers. For example, the profit for a high-quality monopolist becomes $\zeta\Pi(P, A, b, H) + (1 - \zeta)\Pi(P, A, 1, H)$. Linnemer (2002) develops a static model of this kind. When $c(H) > c(L)$ and an intermediate number of informed consumers exists, he shows that dissipative advertising may be used along with a high (supra-monopoly) price to signal high quality. Linnemer’s model shares important formal features with the Milgrom-Roberts (1986) model, as I explain below.

It is also possible to extend the model to allow for multiple sellers. Under the assumption that advertising is dissipative, Kihlstrom and Riordan (1984) explore a model in which quality is high or low and firms are competitive price takers, where the price that is “taken” may differ depending upon whether a firm is perceived to offer a high- or low-quality product. In this context, advertising can be understood as an “entry fee” that is necessary to enter the high-quality

⁹³For further discussion, see Orzach, Overgaard and Tauman (2002) and Zhao (2000).

market. They show that dissipative advertising can signal high quality even in a static model, if marginal cost is sufficiently lower when quality is high. The idea is that a high-quality firm then enjoys a larger mark-up from a sale in the high-quality market, and so the advertising expenditure can fall in a range that only a high-quality firm would be willing to incur.⁹⁴

As Fluet and Garella (2002) and Hertzendorf and Overgaard (2001) demonstrate, dissipative advertising may also signal high quality in a static duopoly model. In the Hertzendorfer-Overgaard model, exactly one seller offers a high-quality product, but consumers do not know the identity of this seller. A key feature of this model is that the sellers share private information as to the identity of the high-quality firm. As a consequence, one seller's price-advertising selection provides potential information concerning the other seller's quality. This enriches the set of signaling possibilities.⁹⁵ Under the assumption that marginal cost is independent of quality, dissipative advertising is sometimes used as a signal of quality, and the correlation between advertising and quality is highest when the quality difference is intermediate in size. Allowing that marginal cost increases with quality, Fluet and Garella conduct a related analysis and find that any separating equilibrium entails positive advertising by the high-quality firm, provided that the quality difference is not too great.

6.2. Repeat-Business Effect

Nelson (1974b) argues that advertising rekindles memories of experiences with the advertised product. As recollections are more likely to prompt repeat business when the quality of product is high, a high-quality product may be advertised to a greater extent, and even new consumers may thus infer high quality from heavy advertising. I now summarize several recent efforts that use explicit dynamic models in order to capture a repeat-business effect. These efforts differ somewhat from Nelson's conception, in that a memory-activation process is not modeled; instead, the repeat-business effect emerges in the following sense: the return from advertising and thereby achieving an initial sale may be greater for a high-quality product, due to the greater repeat purchases that come from satisfied customers.

⁹⁴Wiggins and Lane (1983) also consider the manner in which advertising may signal quality when prices are fixed. In their model, consumers are risk averse, and advertised products are of more uniform quality.

⁹⁵For other multi-sender signaling models, see Bagwell and Ramey (1991), de Bijl (1997) and Matthews and Fertig (1990).

Schmalensee (1978) offers a first formal investigation. As noted above, he argues that the marginal cost of production is greater when a high-quality good is produced. Under the assumption that all sellers must charge the same price, the value of an initial sale may be greater when a low-quality good is sold, as then the mark-up is larger. This “reverse” signaling-efficiency effect favors low-quality firms and can counter the repeat-business effect that favors high-quality firms. Indeed, Schmalensee demonstrates that low-quality products are more heavily advertised, if consumers are responsive to advertising and marginal cost is sufficiently greater for a high-quality product.

As Schmalensee acknowledges, a weakness of his model is that consumer behavior is irrational: consumers are responsive to advertising, even though advertising is associated with low-quality products. This weakness is addressed by Kihlstrom and Riordan. I discuss above their finding for a static model, but they also consider a two-period formulation that allows for a repeat-business effect. Due to this effect, the value of an initial (first-period) sale is greater for a high-quality firm, and so dissipative advertising can signal high quality even if low-quality firms enjoy a modest marginal-cost advantage. The precise extent of the critical advantage varies with the particular assumption that is made as to the information held by second-period consumers.

Working with a monopoly model, Milgrom and Roberts (1986) allow that consumers may draw product-quality inferences from advertising and price. Formally, Milgrom and Roberts extend the static model with dissipative advertising to include a second period. The product is non-durable, and consumers have unit demands in each period and heterogeneous reservation values. When a product is consumed, the consumer discovers whether he is satisfied with the product. A satisfied consumer enjoys the gross surplus (measured by the reservation value) that the product offers, while an unsatisfied consumer receives zero gross surplus. Product quality is operationalized as the probability that a randomly selected consumer finds the product satisfactory. If the product is satisfactory for a consumer in the first period, then it will remain so for this consumer in the second period. In the second period, the monopolist sells only to consumers that purchased in the first period and had a satisfactory experience.

The main features of their analysis may be understood with reference to a two-period profit function, $V(P, A, b, t) = \Pi(P, A, b, t) + \delta\tilde{\pi}(P, b, t)$, where $\delta \in (0, 1)$ is the discount factor and $\tilde{\pi}$ is a reduced-form profit function for the second period. As above, the consumers’ belief b derives from first-period price and advertising observations: $b = b(P, A)$. It is natural to assume that $\tilde{\pi}$ is decreasing in P and

increasing in b , since a firm can earn greater second-period profit if it sold to a larger number of consumers in the first period. More importantly, I assume that $\tilde{\pi}$ embodies a repeat-business effect in the following sense: $\tilde{\pi}_P$ is higher when $t = L$ than when $t = H$.

The intuition for the repeat-business effect is as follows. For any given belief, when the monopolist raises its first-period price, some consumers elect not to buy. Consider whether these “lost” consumers are of greater value to a low- or high-quality monopolist in the second period. There are two considerations. First, lost consumers might be more painful for the high-quality monopolist, since a greater fraction then would have been satisfied and thus given repeat business. Second, if marginal cost increases with quality, then lost consumers might be less painful for the high-quality monopolist, since a smaller markup then would be enjoyed on those lost consumers that did offer repeat business. The first (second) consideration works in favor of (against) the assumption made above. The assumption therefore holds if the high-quality monopolist has a weak cost advantage ($c(H) \leq c(L)$) or if any cost disadvantage of high-quality production is sufficiently modest.

Consider now the implications of the assumption that advertising is dissipative. First, the first-period profit function depends directly upon advertising only through the cost of advertising: $\Pi_A = -\kappa$. A second implication, already reflected in the notation, is that $\tilde{\pi}$ depends on A only through the belief function $b(P, A)$. Third, advertising occurs (if at all) only in the introductory period. The monopolist would not advertise in the second period, since advertising does not directly alter demand and no opportunities for signaling remain (for all second-period consumers the product is already known to be satisfactory). Finally, in a separating equilibrium, if the monopolist offers a low-quality product, then it selects zero advertising. In analogy with the discussion above, in a separating equilibrium, the low-quality monopolist picks its complete-information monopoly price-advertising pair. When advertising is dissipative, the complete-information solution entails zero advertising.

In the least-cost separating equilibrium, is it possible that the high-quality monopolist picks positive advertising? Let $v_M(L)$ denote the discounted two-period profit that the low-quality monopolist earns in a separating equilibrium. In the least-cost separating equilibrium, the price-advertising pair selected by the high-quality monopolist solves the following program:

$$\underset{P,A}{Max} V(P, A, 1, H) \text{ subject to } V(P, A, 1, L) \leq v_M(L). \quad (6.5)$$

Suppose that the solution to (6.5) entails positive advertising. Then the first-order condition for advertising is $V_A(P, A, 1, H) = \lambda V_A(P, A, 1, L)$. Given that advertising is dissipative, this condition reduces to $\lambda = 1$. Consider next the first-order condition for price. Using $\lambda = 1$, this can be written as

$$\Pi_P(P, A, 1, H) - \Pi_P(P, A, 1, L) = \delta[\tilde{\pi}_P(P, 1, L) - \tilde{\pi}_P(P, 1, H)]. \quad (6.6)$$

Thus, if the high-quality monopolist chooses a positive amount of dissipative advertising, then the high-quality price must satisfy (6.6).

Consider first the case in which $c(H) > c(L)$. Then the left-hand side of (6.6) is positive. The right-hand side of (6.6) is also positive, due to the repeat-business effect. In this case, therefore, it is possible that a high-quality monopolist signals its quality with a positive level of dissipative advertising along with a distorted price. Milgrom and Roberts discuss the specific circumstances under which such a separating equilibrium occurs. Consider second the case in which $c(H) \leq c(L)$.⁹⁶ Then the left-hand side of (6.6) is non-positive. Given that the right-hand side is positive under the repeat-business effect, (6.6) cannot be satisfied. A main conclusion is now apparent: in the least-cost separating equilibrium, the high-quality monopolist uses dissipative advertising to signal its quality only if the marginal cost of production is greater for a high-quality product.

The underlying intuition is as follows. When the monopolist raises its first-period price, its sales for the first period are reduced. If a high-quality product entails a higher marginal cost, this first-period effect is less painful for a high-quality monopolist. The price hike also reduces sales in the second period, since there are then fewer satisfied consumers that emerge from the first period. Under the repeat-business effect, this second-period effect is more painful for a high-quality monopolist, as a greater fraction of its first-period consumers would have had a satisfactory experience. Due to these offsetting effects, the cost of a price increase can be equalized across the low- and high-quality types of monopolists (i.e., (6.6) can hold). As both types also experience the same cost from dissipative advertising, the monopolist may have no better option than to use both a distorted price and a positive advertising expenditure when signaling high quality. By contrast, if marginal cost (weakly) falls with quality, then the cost of a price hike is (weakly) greater for a high-quality monopolist. The high-quality product is then best signaled with a low price and no advertising.

⁹⁶In the two-period model, future demand depends directly upon actual quality, and it is possible that a separating equilibrium exists even when $c(H) = c(L)$.

It is interesting to compare the predictions of the Milgrom-Roberts model with those of the static model. In the static model, dissipative advertising is not used as a signal. Furthermore, when advertising is demand-enhancing and $c(H) > c(L)$, a high-quality monopolist distorts its advertising downward, with advertising rising in the future (once consumers are informed) to its undistorted level. By contrast, in the dynamic model, if $c(H) > c(L)$, then a high-quality monopolist may use dissipative advertising as a signal, with advertising falling in the future to its undistorted level of zero. The inclusion of the repeat-business effect thus generates novel predictions, illustrating further the complex relationship between advertising and product quality. Finally, recall Linnemer's (2002) extension of the static model. In his model, the profit earned on informed consumers plays a role analogous to that played by second-period profit in the Milgrom-Roberts model.⁹⁷

Hertzenndorf (1993) offers an interesting extension. He supposes that consumers observe the monopolist's advertising expenditure with error. By contrast, the monopolist's price is perfectly observed. If no advertising is observed, it may be unclear whether the firm failed to advertise or the consumer failed to observe the advertising. In this setting, if the monopolist's price reveals quality, then the monopolist will not use advertising as a signal. Intuitively, if the monopolist were to use advertising, then it could deviate to a lower advertising level, without being detected and without altering the consumers' belief (since price already reveals quality). Advertising may be used, however, when the monopolist's price is independent of product quality.⁹⁸ In this case, if repeat-business effects are sufficiently large and/or marginal cost does not rise too swiftly with quality, then the high-quality monopolist advertises to a greater extent.

Horstmann and McDonald (1994) consider a different kind of noise. In their model, consumers observe price and advertising perfectly, but the consumption experience generates only an imperfect indication of quality. Specifically, they consider a two-period model in which a monopolist privately observes whether the quality of its product is high or low, where the marginal cost of production is independent of quality and in each period a higher quality product yields a satisfactory experience with a higher probability. A consumer's experience with

⁹⁷In Linnemer's static model, the formal analog of the repeat-business effect emerges in the following way: over the range of prices that a high-quality monopolist might choose, a price increase diminishes the profit earned on informed consumers by a greater amount for a high-quality monopolist.

⁹⁸Moraga-Gonzalez (2000) offers a related finding in a model in which advertising provides direct information about product quality but not all consumers observe advertising efforts.

the product is then not fully informative: a product may offer a satisfactory experience in the first period and fail to do so in the second period. In the first period, there is no basis for the monopolist to use price and advertising as signals of quality. Imperfect signaling is possible in the second period, however, since this period has a greater expected number of satisfied consumers when quality is high. In a refined equilibrium, second-period play takes the following form: the high-quality monopolist prices high and advertises, while the low-quality monopolist sometimes adopts this behavior and otherwise sets a low price and does not advertise. The high price is such that a consumer purchases in period two only if the product yielded a satisfactory experience in period one. Two predictions follow. First, advertising does not signal the quality of newly introduced goods. Second, advertising can signal the quality of an established good, but even then the signal is imperfect. These predictions offer further interpretations for empirical efforts (see Section 3.2.5) that report a generally weak advertising-quality correlation that is stronger for established products.⁹⁹

6.3. Match-Products-to-Buyers Effect

I consider next Nelson's (1974b) match-products-to-buyers effect, whereby even seemingly uninformative advertising can provide indirect information that improves the match between product and buyer, since a firm has greater incentive to send its ads to those consumers that value its product the most. Aspects of this effect appear in some of the preceding discussion. In particular, Grossman and Shapiro (1984) provide conditions under which advertising that contains direct information as to a product's existence, attributes and price serves to increase consumer surplus by generating improved matches and expanded sales. In the following, I consider work in which the matching effect operates in markets for which consumers are already informed of the existence of products. This work emphasizes advertising that provides information as to the attributes of the advertised product, where the information may be direct or indirect.

Meurer and Stahl (1994) offer a model in which advertising provides direct information as to horizontal attributes. In their model, there are two firms, and each consumer desires one unit of the product. For a given consumer, one product is a good match and offers gross utility V , while the other product is a bad match and offers zero gross utility. In the first stage of the game, firms simultaneously

⁹⁹For other interpretations, see Orzach, Overgaard and Taumann (2002), Zhao (2000) and the discussion above in Section 6.1.

choose advertising levels. An ad provides direct and truthful information as to attributes of the advertised product. A recipient of an ad thus knows whether the advertised product offers a good match. If it does not, then the other product must. For a consumer that receives no ad, the two products are homogeneous and each provide an expected gross utility of $V/2$. Advertising therefore induces product differentiation. This is consistent with some of the arguments advanced by proponents of the persuasive view, although here advertising-induced product differentiation derives not from a change in tastes but from the information that advertising provides. In the second stage of the game, each firm sets its (publicly observed) price. The marginal cost of production is $c < V/2$.

As Meurer and Stahl show, the effects of advertising on social surplus are non-monotonic. The equilibrium characterization entails mixed strategies, but the key idea is easily related. On the one hand, as advertising increases, more consumers are “informed” (i.e., receive an ad) and thus obtain a good match. On the other hand, at higher levels of advertising, the extent of product differentiation is greater and each firm has more market power. In particular, each firm is then especially tempted to raise price to V and profit on those informed consumers for which its product offers a good match. But expected sales are then reduced, since uninformed consumers are unwilling to purchase at this price. The better-matching and reduced-sales effects of advertising are conflicting. The result is a non-monotonic relationship between advertising and social surplus. Building on these themes, Meurer and Stahl show further that the Nash advertising level may be excessive or inadequate.

Bagwell and Ramey (1993) present a model in which advertising offers indirect information as to vertical attributes.¹⁰⁰ In their model, marginal cost is constant in quantity but increasing in quality, and consumers possess downward-sloping demands. Some consumers prefer high-quality, high-priced goods, while others prefer low-quality, low-priced goods. Advertising may then provide information that better enables buyers to match with their respective preferred products. Formally, they consider a three-stage game. In the first stage, firms choose whether to enter. If a firm enters, then at the same time it chooses its price, quality level and advertising activities (i.e., claims and expenditures). In the second stage, each consumer observes advertising activities, but not price and quality choices, and picks a single firm to visit. Finally, in the third stage, each consumer observes

¹⁰⁰For an early discussion in which advertising plays a matching role in a market with vertically differentiated products, see Rosen (1978). He proceeds under the assumption that advertised claims are truthful.

the price and quality at the selected firm and chooses a purchase quantity.¹⁰¹

No external authority ensures the veracity of advertising claims. A firm that offers one quality of product may mimic the advertised claims and expenditures of firms that offer the other quality of product. The benefit of misrepresentation is that a firm thereby “tricks” consumers that prefer the alternative price-quality offering into visiting its store. But there is also a cost: the misrepresenting firm loses those consumers that prefer its (true) price-quality offering and to whom it otherwise would have sold. The net gain from misrepresentation hinges upon the differences in market share that accrue to firms offering the different qualities. An equilibrium in which advertising provides information is thus possible only if prices, advertising activities, and market shares satisfy incentive-compatibility and free-entry conditions.

Fortunately, a sorting condition is available. A “refined” (i.e., quality-sensitive) consumer may yield more profit to a high-quality firm, since the demand expansion that ensues is sufficient to overwhelm the higher marginal cost. Likewise, a “plain” (i.e., less quality-sensitive) consumer may yield more profit to a low-quality firm, since the lower marginal cost then dominates any increase in demand that a high-quality product might induce. If the market shares are sufficiently similar across qualities, then costless advertising claims (“cheap talk”) are credible, as under the sorting condition a firm does not gain from trading consumers that prefer its product for a similar number of consumers that do not. But if market shares differ sufficiently across qualities, then firms that offer the low-market-share quality are tempted to misrepresent, and so firms that provide the high-market-share quality must use dissipative advertising expenditures to discourage mimicry and credibly signal quality.

What determines the extent to which market shares vary with quality? In a free-entry equilibrium, high market shares are associated with high fixed costs. Thus, if fixed costs are roughly constant across quality levels, then cheap talk credibly communicates quality. On the other hand, if fixed costs vary significantly with quality, then dissipative advertising is used by firms offering the quality of product that has the higher fixed costs.

¹⁰¹In this game, the product is a search good. Bagwell and Ramey also analyze the possibility of an experience good, in which case quality is not observed at the time of purchase.

6.4. Quality-Guarantee Effect

Up to this point, I have emphasized the extent to which advertising signals product quality, when quality is exogenous or determined by a once-and-for-all choice. In many markets, however, firms offer experience goods and must be given incentive to provide a high-quality good in each period. An intertemporal tradeoff is suggested. On the one hand, a firm's short-run incentive is to save costs and offer unsuspecting consumers a low-quality product. Balanced against this short-term benefit, however, is the long-run cost of a lost reputation for quality. A firm that saves costs and provides a low-quality good today foresakes its reputation and thus the profit that it could earn on repeat sales tomorrow.

Where does advertising fit in? The reputational argument just advanced presumes that the firm is not anonymous. Clearly, a firm must be identifiable if it is to be rewarded with repeat business only when it provides high-quality products. In turn, a firm may acquire a "name" by advertising its brand. From this perspective, advertising is associated with higher-quality products, since a "known" firm is reluctant to lose its reputation by offering a shoddy product. Advertising thus has a quality-guarantee effect that is reassuring even to first-time buyers.

The quality-guarantee effect is emphasized by early writers. Fogg-Meade (1901), Marshall (1919) and Shaw (1912) all argue that the advent of large-scale advertising gave manufacturers a significantly greater incentive to provide high-quality products. As observed in Section 2.2, Braithwaite (1928) takes an opposing view and argues that the quality-guarantee effect is modest, while Galbraith (1958, 1967) and Packard (1957, 1969) go further and suggest that brand advertising has powerful and negative social consequences. The same debate continues in the modern era, perhaps with even greater intensity, as the effects of "globalization" are scrutinized. *The Economist* (2001), for example, argues that a brand name removes the curtain of anonymity and makes a firm accountable for the quality of its product and the working conditions of its laborers. But Klein (2001) contends that persuasive (life-style) advertising is an important means by which brand-name multinationals influence media, shape culture and generally distort the economic and social aspirations of individuals.

This on-going debate is not resolved here. Accommodating aspects of both views, I assume that a monopolist's brand is known to consumers by name and that advertising is demand-enhancing (perhaps due to its persuasive powers). In this general context, my goal is to investigate the theoretical underpinnings of the quality-guarantee effect. Two questions are asked. First, in what manner must the monopolist distort its price and/or advertising selections, in order to provide a

quality-guarantee effect? Second, among those price-advertising selections that do guarantee a high-quality product, which selection is preferred by the monopolist? By answering these questions, I hope to determine whether advertising may play a quality-guarantee role, even when consumers already know the brand name and the monopoly can also provide quality assurances with its price.

Formally, I consider an infinitely repeated game. In each period, the monopolist chooses a price P , an advertising level A and a quality level t , where quality is either low or high: $t \in \{L, H\}$. Consumers observe P and A but not t , form a belief b as to the probability that the monopolist has selected a high-quality product, and then demand a quantity $D(P, A, b)$. After any consumption experience is concluded, the monopolist earns profit $\Pi(P, A, b, t) \equiv (P - c(t))D(P, A, b) - \kappa A$ and consumers observe the chosen quality t . Assume that a high-quality product involves a higher marginal cost of production ($c(H) > c(L)$). Departing from the structure developed above, assume further that a consumer would never knowingly purchase a low-quality product ($D(P, A, 0) = 0$). The stage game is then repeated. I focus on stationary subgame perfect equilibria. In a stationary equilibrium, along the equilibrium path, the monopolist makes the same price, advertising and quality choices in every period.

To fix ideas, suppose for the moment that the stage game is *not* infinitely repeated. In a static model, for any given price and advertising expenditure, if consumers were to form a belief that results in a positive demand, then the monopolist would surprise consumers with a low-quality product, as it would thereby save costs without affecting demand. This logic also carries through in any finite-horizon game. The firm would “cheat” and provide low-quality in the last period. Using backward induction, it follows that no transaction ever occurs.

In the infinitely repeated game, however, the short-run cost savings that accompany a low-quality selection can be balanced against an associated long-run reputational cost. Suppose that consumers believe that the monopolist will provide a high-quality product if and only if it has always done so before and the price and advertising selections fall in a range that guarantees quality. Formally, quality is guaranteed for a reputable firm when the price and advertising selections fall in the range for which

$$\Pi(P, A, 1, L) - \Pi(P, A, 1, H) \leq \sum_{t=1}^{\infty} \delta^t \Pi(P, A, 1, H), \quad (6.7)$$

where $\delta \in (0, 1)$ is the discount factor. The left-hand side represents the short-run cost savings that the monopolist enjoys when it cheats and surprises consumers

with a low-quality selection. The right-hand side captures the long-run reputational cost that the monopolist incurs, if it cheats in the current period and thereby sacrifices its reputation and the prospect of repeat purchases at all later dates.¹⁰² The monopolist has the incentive to provide a high-quality product if the price and advertising selections satisfy (6.7).

Recalling the first question raised above, I now characterize the price and advertising selections that guarantee quality. The incentive constraint captured in (6.7) may be re-written as follows:

$$(c(H) - c(L))D(P, A, 1) \leq \frac{\delta}{1 - \delta} \{(P - c(H))D(P, A, 1) - \kappa A\}. \quad (6.8)$$

Let the interest rate r be defined by $\delta = 1/(1 + r)$. It is now straightforward to re-write (6.8) as:

$$[P - (c(H) + r(c(H) - c(L)))]D(P, A, 1) - \kappa A \geq 0. \quad (6.9)$$

As (6.9) reveals, the monopolist has the incentive to provide a high-quality product if and only if its price and advertising selections would generate non-negative profit, under a hypothetical situation in which the firm's marginal cost is $c(H) + r(c(H) - c(L))$ and consumers believe that product quality is high.

An important implication is that the monopolist provides a high-quality product only if the price strictly exceeds the true marginal cost, $c(H)$. Intuitively, the monopolist will forego the current-period opportunity to cheat consumers only if profitable repeat business then would be lost in the future. Notice that advertising is not essential for the quality-guarantee effect (once the name of the product is known). To see this, put $A = 0$ and observe that (6.9) holds if and only if

$$P \geq c(H) + r(c(H) - c(L)). \quad (6.10)$$

When price exceeds this critical level, the quality-guarantee effect is achieved through price alone.

Consider now the second question raised above. Among those price-advertising selections that guarantee quality, which one maximizes the monopolist's profit? The profit-maximizing selection solves the following program:

$$\max_{P, A} \Pi(P, A, 1, H) \text{ subject to (6.9)}. \quad (6.11)$$

¹⁰²If the monopolist cheats, then in all future periods play reverts to the Nash equilibrium of the static game, whereby the monopolist does not advertise and offers a low-quality product while consumers do not purchase. The monopolist then earns zero profit.

The associated Lagrangian can be expressed as

$$L(P, A, \lambda) = (1 + \lambda) \left\{ \left[P - \left(c(H) + \frac{\lambda}{1 + \lambda} r(c(H) - c(L)) \right) \right] D(P, A, 1) - \kappa A \right\}, \quad (6.12)$$

where λ is the Lagrange multiplier. As the bracketed term in (6.12) reveals, in the most-profitable stationary equilibrium the monopolist offers a high-quality product and makes the same price-advertising selection as it would were it to produce at constant marginal cost $c_1 \equiv c(H) + \frac{\lambda}{1 + \lambda} r(c(H) - c(L))$ and offer a product of known high quality.

The reputation model exhibits a surprising similarity to the static signaling model of Section 6.1. As in the static model, a cost-increasing distortion is implied: the high-quality monopolist does best when it sets the same price-advertising pair as it would were its quality of product known but its marginal costs higher ($c_1 > c(H)$). In comparison to the complete-information and high-quality monopoly price and advertising selections, an upward distortion in price and a downward distortion in demand-enhancing advertising is again predicted. Intuitively, the upward distortion in price and downward distortion in advertising contribute to a *downward* distortion in demand, thereby reducing the short-run cost savings that would be gained if the monopolist were to cheat.

Klein and Leffler (1981) offer an early formalization of some of these themes. They establish that a competitive firm has incentive to offer a high-quality product only if price exceeds marginal cost for the high-quality product (so that repeat business has value). Their expression for the “quality-assuring price” is analogous to (6.10).¹⁰³ They also introduce advertising as an investment in brand-name capital that is forfeited if a firm degrades its reputation. In light of such advertising expenses, they argue that the zero-profit requirement of competitive markets may be reconciled with a positive markup. An implication is that an observed correlation between advertising and profit (see Section 3.2.2) may reflect the rents that are necessary for high-quality performance rather than the presence of market power that is brought forth by an advertising-induced barrier to entry.

The reputation model presented above may be modified to illustrate the investment interpretation of advertising that Klein and Leffler advance. In particular, consider an equilibrium in which the monopolist does not advertise through time (i.e., $A = 0$), but does advertise at the time of entry. Suppose further that the

¹⁰³The formal expression in (6.10) is first derived by Shapiro (1983). See also Telser (1980) for related discussion.

initial advertising A_0 creates actual brand-name capital, in that it causes a (reputable) monopolist's demand to grow through time, where the (constant) rate of growth increases with the initial advertising outlay. Two implications follow. First, if the initial advertising outlay is increased, then the monopolist faces a greater long-term loss from cheating (since a faster-growing consumer demand is forfeited), and so a lower quality-guaranteeing price can be achieved. Importantly, advertising that creates brand-name capital may thus represent a means through which a firm can offer a more competitive price while maintaining its incentive to offer a high-quality product. Second, if consumers require a sufficient up-front investment in advertising, it remains possible to reconcile a positive markup with a zero-profit condition.¹⁰⁴ Interesting future work might expand this framework to allow for multiple firms that can choose to invest in advertising at any date.

Klein and Leffler also discuss the possibility that consumers may be uninformed as to firms' costs. They introduce the provocative idea that a firm's dissipative advertising expenditure may signal its cost type and thereby influence consumers' quality perceptions. Intuitively, a firm benefits if consumers believe it to have low costs (where a firm has "low costs" if for that firm $c(H) + r(c(H) - c(L))$ is low), since it can then offer a lower quality-guaranteeing price. While the idea is simple and intuitive, the appropriate formalization is non-trivial, as it involves dynamic signaling in a rivalrous environment. Rogerson (1986) offers a formal investigation of this kind. This area, too, represents a promising direction for further work.

Finally, consider the implications of the reputation theory for multiproduct firms. Suppose that the framework above is extended to allow that the monopolist carries two products. If the products do not have the same brand name, then consumers may be unaware that the products are linked. The quality-guaranteeing price for each product might then be determined by the product-by-product application of the incentive constraint captured in (6.9). Now suppose that the products have a common brand name. They are then linked in the consumers' minds, and the monopolist may lose repeat business on both products if it cheats on either. In the relevant incentive constraint, the product-by-product incentive constraints are pooled (i.e., added together): the gains from cheating on both prod-

¹⁰⁴Formally, suppose that demand at time t is given as $g(A_0)^t D(P, 0)$, where $g(A_0) - 1$ is the demand growth rate and P is the stationary price selection. Suppose that $g(0) = 1$, $g' > 0$, and $\delta g(A_0)$ is bound below unity. Then δ in (6.8) is replaced by the effective (growth-included) discount factor, $\delta_e \equiv \delta g(A_0)$. The quality-guaranteeing price is again given by (6.10), when r is replaced by the effective interest rate, $r_e \equiv [1 + r - g(A_0)]/g(A_0)$. Observe that $\text{sign}\{r - r_e\} \equiv \text{sign}\{g(A_0) - 1\} > 0$ for $A_0 > 0$. Finally, the monopolist earns discounted profit in amount $\Pi(P, 0, 1, H)/(1 - \delta_e) - \kappa A_0$, which is driven to zero at a finite and positive level for A_0 .

ucts must be no greater than the loss in profits on both products that cheating would imply. It is possible that the monopolist can be induced to supply high-quality products, even when the price-advertising selection for one product would fail the incentive constraint for that product alone. A firm can thus benefit when its products are branded, since branding expands the set of quality-guaranteeing price-advertising selections.¹⁰⁵ This discussion reinforces the argument that advertising can motivate high-quality choices by reducing anonymity and making brand names known.

6.5. Summary

A huge theoretical literature analyzes the relationship between advertising and product quality. The relationship is subtle, and it varies across circumstances. One set of work analyzes the manner in which advertising may signal quality. In this context, the advertising-quality relationship can be understood with reference to the three effects that Nelson (1974b) identifies. These effects provide a basis for a positive relationship between advertising and product quality. But the signaling-efficiency effect may be reversed in a number of environments, since higher-quality goods may use more expensive materials and thus have higher marginal costs. In such environments, greater advertising may be associated with higher quality *if* Nelson's other effects are prominent. The main empirical implication is that no systematic correlation between advertising and quality is expected, since the relationship reflects market circumstances and the simultaneous use of price and advertising as signals of quality. This implication is consistent with the empirical work summarized in Section 3.2.5. It also motivates new empirical work (as discussed in Section 8) that considers price and advertising as joint signals.

A second set of work investigates the extent to which advertising may provide an incentive for the continued selection of high-quality products. As early writers argue, advertising can play an important role by making brands known and identifiable, so that brand reputations can be forged and maintained. Once brands are known, however, if advertising enhances current demand, then the quality-guarantee effect is most profitably generated when price is distorted up and advertising is distorted down. If advertising also creates brand-name capital

¹⁰⁵For further formal analyses of branding and product quality, see Bagwell (1992), Cabral (2000, 2001), Choi (1998), Montgomery and Wernerfelt (1992) and Wernerfelt (1988). The general idea that incentive constraints are relaxed when pooled is also exploited in the collusion literature. See Telser (1980) for a first formalization. Further analysis is offered by Bernheim and Whinston (1990).

by enhancing future demand, then it appears possible that a firm may distort its advertising upward, in order to be able to offer a lower quality-guaranteeing price.

7. Advertising and Entry Deterrence

With a few exceptions, the theory summarized above does not address the relationship between advertising and entry. This is an important omission, since the persuasive view hypothesizes that advertising exerts an entry-deterrence effect. As discussed in Section 3, the empirical support for this hypothesis is mixed. In the absence of an empirical resolution concerning the relationship between advertising and entry, theoretical analyses may be of special value.

In the tradition of Bain's (1949) limit-pricing model, many of the first models of advertising as an entry barrier employ the assumption that the incumbent can credibly commit to maintain its pre-entry advertising expenditures if entry occurs.¹⁰⁶ A high pre-entry advertising expenditure may then imply a hostile environment for a potential entrant, in which case such advertising may deter entry. But the credibility of this commitment is questionable. As Needham (1976) argues, in the absence of such a commitment, an incumbent's pre-entry advertising influences the entry decision only if there is some link between pre-entry advertising and the entrant's post-entry expected profit.¹⁰⁷

I consider here two possible links. First, advertising may have a goodwill effect, so that some consumers favor the incumbent in the post-entry period when the incumbent advertises heavily in the pre-entry period. While the empirical studies reviewed in Section 3.1.1 suggest that the goodwill effect of advertising is usually modest, the effect may be pronounced in certain industries. Second, the incumbent's pre-entry advertising behavior may signal the incumbent's private information and thereby affect the entrant's expected profit from entry.

7.1. Advertising and Goodwill

If advertising generates goodwill for the incumbent, then it is natural to expect that an incumbent could deter entry by engaging in heavy pre-entry advertising. But is this expectation confirmed in an equilibrium model? To answer this question, the source of the goodwill effect must be specified. An "informational

¹⁰⁶See, for example, Salop (1979), Spence (1980) and Williamson (1963).

¹⁰⁷See also Cubbin (1981).

goodwill effect” is present, if an incumbent’s pre-entry advertising provides consumers with hard information of durable value concerning the incumbent’s existence and prices. The incumbent might include its location and phone number on the ads, for instance. Alternatively, as persuasive-view advocates emphasize (see Section 2.2), the incumbent’s pre-entry advertising generates a “reputational goodwill effect,” if in some general sense it reinforces consumers’ past experiences so as to differentially reward an established firm. For example, the incumbent’s advertising efforts may reinforce any reputation that it has for providing reliable and high-quality products.

In Schmalensee’s (1983) model, an informational goodwill effect is posited. He considers a homogenous-products market served by an incumbent and potentially an entrant. Consumers learn of a firm’s existence and price through an advertising technology of the kind proposed by Butters (1977). The three-stage game proceeds as follows. In the first (pre-entry) stage, the incumbent sends out ads to consumers. A consumer who receives such an ad is informed of the incumbent’s existence and can learn the incumbent’s (eventual) price at zero cost. In the second stage, after observing the incumbent’s advertising behavior, the entrant considers whether to incur a sunk cost and enter. If entry occurs, then the entrant sends out its own ads. In this event, each firm then has a set of captive consumers, and there is also a set of selective consumers. Finally, in the third (post-entry) stage, active firms play some simultaneous-move oligopoly game. As Schmalensee observes, if entry occurs and firms choose prices, then a pure-strategy Nash equilibrium does not exist. He thus supposes that the firms compete in quantities.

In this model, advertising is a durable investment and entry entails a sunk cost. It is thus tempting to reason by analogy with Dixit’s (1980) entry-deterrence model and conclude that the incumbent strategically overinvests in advertising in order to deter entry. But this analogy is false. As Schmalensee shows, the incumbent can deter entry, but it does so with a *reduced* advertising expenditure. Intuitively, if the incumbent were to advertise heavily, then it would have many captive consumers. The incumbent would then be tempted to set a low output, so as to sell only to these consumers at a high price. A rational entrant would thus perceive that the incumbent would be a “soft” competitor. Consequently, if the incumbent seeks to deter entry, it should underinvest in advertising, thereby ensuring that it has few captive consumers and would respond to entry with vigorous competition for selective consumers.

Ishigaki (2000) modifies this three-stage game to allow that post-entry competition occurs in prices. After characterizing the mixed-strategy pricing equilibria

that entry induces, Ishigaki finds that the entry is either blockaded (the incumbent deters entry when it behaves as it would were there no entrant) or accommodated (the incumbent optimally allows entry and sets its Stackelberg advertising level). There is no parameter region for which the incumbent strategically distorts its advertising choice in order to deter entry. Together, the models of Schmalensee and Ishigaki suggest the following striking conclusion: in homogeneous-products markets, when the goodwill effect of advertising is informational, a profit-maximizing incumbent does not deter entry by investing more in advertising than it would were there no entry threat. These models therefore provide no formal support for the entry-deterrence effect.

As Fudenberg and Tirole (1984) establish, a similar conclusion obtains when the incumbent and entrant sell differentiated products. They consider a simple two-period model that captures some of the central themes raised above. In the first (pre-entry) period, the incumbent (firm 1) chooses a fraction Φ_1 of consumers to inform of its existence and price. As in the Grossman-Shapiro (1984) model, the cost to the incumbent of informing a fraction Φ_1 is $A(\Phi_1)$, where $A(\Phi_1)$ is positive, increasing and convex for $\Phi_1 > 0$. Assume further that it is prohibitively costly to reach all consumers: $A(1) = \infty$. The informational goodwill effect is captured with a strong assumption: consumers who receive an ad in the first period do not bother to read any ads that they may receive in the second (post-entry) period, and they thus remain captive consumers for the incumbent throughout the game. The incumbent selects its monopoly price in the pre-entry period and achieves thereby net revenue in amount $R_M > 0$ per consumer. The incumbent's pre-entry profit is thus $\Phi_1 R_M - A(\Phi_1)$.

In the second period, the incumbent and the entrant (firm 2) make advertising and pricing selections. Under the goodwill assumption, $1 - \Phi_1$ consumers remain in the second period that are not captive to the incumbent. Fudenberg and Tirole assume that the firms advertise so as to cover the remaining market. Let \bar{A} denote the second-period advertising expenditure incurred by each firm in the course of creating $1 - \Phi_1$ selective consumers. The second-period prices of the incumbent and entrant, respectively, are denoted as P_1 and P_2 . In the second period, the incumbent enjoys per-customer net revenue in amounts $R_1(P_1, P_2)$ from a selective consumer and $R_1(P_1, \infty)$ from a captive consumer. The entrant sells only to selective consumers and enjoys a per-customer net revenue of $R_2(P_1, P_2)$. Assume that the net revenue functions are differentiable, concave in own prices, increasing in rival prices and characterized by positive cross-partial (i.e., for $i = 1, 2$, $\frac{\partial^2 R_i}{\partial P_1 \partial P_2} > 0$). The final assumption indicates that prices are strategic complements.

For this two-period game, payoff functions are defined as follows:

$$\Pi_1(\Phi_1, P_1, P_2) = [\Phi_1 R_M - A(\Phi_1)] + \delta[\Phi_1 R_1(P_1, \infty) + (1 - \Phi_1)R_1(P_1, P_2) - \bar{A}] \quad (7.1)$$

$$\Pi_2(\Phi_1, P_1, P_2) = \delta[(1 - \Phi_1)R_2(P_1, P_2) - \bar{A}], \quad (7.2)$$

where $\delta \in (0, 1)$ is the common discount factor. Assume that a Nash equilibrium (P_1^*, P_2^*) for the second-stage subgame exists and satisfies the first-order conditions

$$\frac{\partial \Pi_1(\Phi_1, P_1, P_2)}{\partial P_1} = \delta[\Phi_1 \frac{\partial R_1(P_1, \infty)}{\partial P_1} + (1 - \Phi_1) \frac{\partial R_1(P_1, P_2)}{\partial P_1}] = 0 \quad (7.3)$$

$$\frac{\partial \Pi_2(\Phi_1, P_1, P_2)}{\partial P_2} = \delta(1 - \Phi_1) \frac{\partial R_2(P_1, P_2)}{\partial P_2} = 0. \quad (7.4)$$

Throughout, the dependence of P_i^* on Φ_1 is suppressed.

Given that prices are strategic complements, (7.3) implies that

$$\frac{\partial R_1(P_1^*, \infty)}{\partial P_1} > 0 > \frac{\partial R_1(P_1^*, P_2^*)}{\partial P_1}. \quad (7.5)$$

In the second period, the incumbent thus would like to raise its price on captive consumers and lower the price that it offers to selective consumers. This is impossible, however, since price discrimination is not allowed here, and so the incumbent picks a second-period price that optimally balances these considerations.

The following relationships are now direct from (7.3), (7.4) and (7.5):

$$\frac{\partial^2 \Pi_1(\Phi_1, P_1^*, P_2^*)}{\partial P_1 \partial \Phi_1} > 0, \quad (7.6)$$

$$\frac{\partial^2 \Pi_2(\Phi_1, P_1^*, P_2^*)}{\partial P_2 \partial \Phi_1} = 0, \quad (7.7)$$

$$\frac{\partial^2 \Pi_1(\Phi_1, P_1^*, P_2^*)}{\partial P_1 \partial P_2} > 0, \quad (7.8)$$

$$\frac{\partial^2 \Pi_2(\Phi_1, P_1^*, P_2^*)}{\partial P_2 \partial P_1} > 0. \quad (7.9)$$

According to (7.6), and as in Schmalensee's model, when the incumbent's pre-entry advertising is greater, it becomes more attracted to higher post-entry prices.

In the formulation considered here, as (7.7) confirms, the incumbent's pre-entry advertising does not directly alter the entrant's preferred price. But, as (7.9) indicates, if greater pre-entry advertising leads the incumbent to price higher, then the entrant becomes attracted to higher prices for this reason.

Under a standard stability condition, it is now direct to confirm that (7.6)-(7.9) yield the anticipated conclusion:

$$\frac{\partial P_1^*}{\partial \Phi_1} > 0 \text{ and } \frac{\partial P_2^*}{\partial \Phi_1} > 0.^{108} \quad (7.10)$$

Thus, as the incumbent advertises more heavily in the pre-entry period, a greater number of captive consumers are created, and so the incumbent prices higher in the post-entry period. Given that prices are strategic complements, the entrant prices higher as well.

Consider now the advertising level at which the incumbent accommodates the entrant in the most profitable manner. Assuming that the second-order condition is satisfied, the incumbent maximizes its payoff when it chooses in the pre-entry period the value Φ_1^* that satisfies the first-order condition $\frac{d\Pi_1(\Phi_1, P_1^*, P_2^*)}{d\Phi_1} = 0$. Using (7.3), this condition may be re-stated as

$$R_M + \delta[R_1(P_1^*, \infty) - R_1(P_1^*, P_2^*)] + \delta(1 - \Phi_1) \frac{\partial R_1(P_1^*, P_2^*)}{\partial P_2} \frac{\partial P_2^*}{\partial \Phi_1} = A'(\Phi_1). \quad (7.11)$$

On the left-hand side of (7.11), the first two terms are positive and capture the direct effect of greater pre-entry advertising on first- and second-period net revenue. The third term is also positive. This term represents the strategic effect of greater pre-entry advertising. As established in (7.10), when the incumbent advertises more heavily, the entrant prices higher. The incumbent thereby earns greater profit in the post-entry period. Finally, the term on the right-hand side captures the cost of additional advertising.

It is interesting to compare Φ_1^* with the value that would occur if the entrant's post-entry price were unresponsive to the incumbent's pre-entry advertising. In the absence of the strategic effect, the left-hand side would be smaller. Given the convexity of the function $A(\Phi_1)$, it follows that the optimal value for Φ_1 would then fall below Φ_1^* . It thus may be concluded that the incumbent overinvests in pre-entry advertising, in order to create a larger captive group of consumers and

¹⁰⁸With P_1 on the y -axis, the stability condition indicates that the second-period pricing reaction function of the incumbent is flatter than that of the entrant.

thereby commit itself to a higher post-entry price, so that the entrant will respond with a higher price of its own. As Fudenberg and Tirole put it, the incumbent best accommodates the entrant by overinvesting so as to become a “fat cat.”¹⁰⁹

Suppose now that the entrant must incur a sunk cost if it chooses to enter. Rather than accommodate the entrant, the incumbent might then choose to deter entry. But how is this achieved? Intuitively, if the incumbent seeks to deter entry, then it may achieve an indirect benefit by underinvesting in advertising, so as to create a small group of captive consumers and thereby commit itself to a low price in the event of entry. Fudenberg and Tirole refer to this as the “lean-and-hungry look.” But an argument also can be made that the incumbent should overinvest in advertising, since it thereby achieves the direct benefit of reducing the entrant’s possible market. To see these competing effects more clearly, use (7.4) and note that the overall effect of pre-entry incumbent advertising on post-entry profit to the entrant is given as follows:

$$\frac{d\Pi_2(\Phi_1, P_1^*, P_2^*)}{d\Phi_1} = \delta[(1 - \Phi_1)\frac{\partial R_2(P_1^*, P_2^*)}{\partial P_1}\frac{\partial P_1^*}{\partial \Phi_1} - R_2(P_1^*, P_2^*)]. \quad (7.12)$$

The first term is positive under (7.10) and captures the indirect benefit to the incumbent of reduced pre-entry advertising, but the second term is negative and reflects the direct benefit to the incumbent of increased pre-entry advertising. As Fudenberg and Tirole observe, in an important set of environments, the indirect benefit of reduced pre-entry advertising dominates, and entry deterrence again requires underinvestment in advertising.

The models developed above, however, all posit an informational goodwill effect. What if instead advertising induces a reputational goodwill effect? To begin, it is useful to distinguish between two issues.¹¹⁰ A first issue is whether an incumbent with an existing reputation for reliable and high-quality products

¹⁰⁹Boyer and Moreaux (1999) consider a different demand specification, under which the entrant also has captive consumers. In their formulation, the incumbent’s advertising level exerts a strategic effect through its impact on the *entrant’s* price reaction curve. For example, when the incumbent and entrant sell substitute products and prices are strategic complements, if the incumbent advertises more heavily, then the entrant has a smaller set of captive consumers, and so the entrant’s price reaction curve shifts downward. In contrast to Fudenberg and Tirole, Boyer and Moreaux argue that the incumbent best accommodates entry by underinvesting in advertising. Furthermore, this finding holds for a variety of sequential-move games and whether the products are substitutes or complements. See Fershtman and Muller (1993) for an earlier discussion of the underinvestment finding when products are substitutes.

¹¹⁰This distinction is explored in Section 2.2. It is also emphasized by Demsetz (1982).

has an advantage relative to an entrant with no existing reputation. Undeniably, this is often the case. Consumers are naturally willing to pay a premium for a product from a reputable firm relative to that which they would pay for a product from an unknown firm. This suggests that informational product differentiation may be a barrier to entry. As Bagwell (1990), de Bijl (1997), Farrell (1986) and Schmalensee (1982) demonstrate, this suggestion is readily confirmed in formal models.¹¹¹ A second issue concerns the extent to which advertising is the source of this entry barrier. With respect to this issue, it is noteworthy that the incumbent is not allowed to advertise in the formal entry-deterrence models just mentioned. In these models at least, there is clearly no formal sense in which advertising is necessary for informational product differentiation to act as an entry barrier.

But might advertising somehow reinforce consumers' past experiences with the established product and thereby exacerbate the informational barrier to entry? It is, of course, possible to assume that advertising is more effective when consumers have greater experience with the advertised product.¹¹² But a more compelling model would yield the reinforcement effect as an implication of optimizing behavior. I am not aware of a model of this kind.

Drawing on the earlier writings, let me highlight one approach that may warrant formalization. As Braithwaite (1928, p. 32), Marshall (1919, p. 307) and Comanor and Wilson (1974, Chapter 4) explain, a firm's ad must bid for the consumer's attention, and it may be more costly for a new firm to get the consumer's attention when the consumer is already overloaded with related ads from established firms. As Comanor and Wilson (1974, p. 47) put it:

“To the extent that the advertising of others creates ‘noise’ in the market, one must ‘shout’ louder to be heard, so that the effectiveness of

¹¹¹Schmalensee (1982) offers a first formalization of the brand loyalty that consumers exhibit toward pioneering brands of known quality. He shows that a high-quality incumbent can earn positive profit without inducing the entry of an equally efficient, high-quality entrant. Bagwell (1990) extends this model to allow that consumers rationally infer quality from price and that the entrant may offer a superior product. The key finding is that a low-quality incumbent may deter entry, even when the entrant actually offers a high-quality (and socially efficient) product. de Bijl (1997) establishes a similar finding for search goods when search costs are high, and shows as well that the entry barrier may be diminished if the incumbent is informed of the entrant's quality. Farrell (1986) extends the analysis to consider the manner in which the incumbent's behavior affects the entrant's incentive to choose a high-quality product. See also Schmalensee (1979) for a detailed discussion of the product-differentiation advantages that accrued to pioneering brands in the market for lemon juice.

¹¹²See Comanor and Wilson (1974, Chapters 3 and 4) for a model in which it is assumed that advertising's effectiveness varies with consumers' experience with the advertised product.

each advertising message declines as the aggregate volume of industry advertising increases. In this case, it will be necessary for new entrants to spend more today to gain an established market position than existing firms spent yesterday, when aggregate industry advertising was probably far less. From these circumstances also, new entrants may have differentially higher advertising costs than did established firms at their entry into the market.”

This “noise effect” suggests that the incumbent may strategically overinvest in advertising, in order to jam the message space and force the entrant to be more stentorian with its advertising efforts. Incumbent advertising would then raise the entrant’s advertising costs and exacerbate the entry barrier. This cost-raising strategy is informally discussed by Hilke and Nelson (1984), who provide evidence in the U.S. coffee market that Maxwell House used such a strategy when facing entry by Folgers. Future work might revisit this noise effect, in a model that endogenizes the manner in which consumers with finite information-storage capabilities manage (as possible) their exposure to advertising.

7.2. Advertising and Signaling

I consider now the possibility that the incumbent’s pre-entry behavior may signal its private information. This information may be relevant for the entrant’s calculation of the expected profit from entry. In this case, an informational link connects the incumbent’s pre-entry behavior and the entrant’s post-entry expected profit.

Milgrom and Roberts (1982) establish that a low-cost incumbent may distort its pre-entry price downward in order to signal its costs and thereby deter entry. Bagwell and Ramey (1988) extend the Milgrom-Roberts analysis to allow that the low-cost incumbent may signal its costs by distorting its pre-entry price and/or advertising. As I explain below, they find that the low-cost incumbent deters entry most profitably, when its pre-entry price is distorted downward and its demand-enhancing advertising is distorted upward.¹¹³ They thus provide a theory in which an incumbent overinvests in advertising in order to deter entry.¹¹⁴

¹¹³Methodologically, the analysis presented below is closely related to that presented above in Section 6.1. Notice, though, that the incumbent now uses price and advertising to signal its cost to an entrant, whereas in Section 6.1 the monopolist uses price and advertising to signal quality to consumers.

¹¹⁴Milgrom and Roberts offer an information-theoretic foundation for Bain’s (1949) prediction that an incumbent can deter entry by limit pricing. Likewise, Bagwell and Ramey provide a the-

Bagwell and Ramey consider a signaling game with two periods. In the pre-entry period, an incumbent of type $t \in \{L, H\}$ selects its pre-entry price $P \geq 0$ and advertising level $A \geq 0$. The incumbent earns pre-entry profit $\Pi(P, A, t) \equiv (P - c(t))D(P, A) - \kappa A$, where $D > 0$, $D_P < 0$, $D_A \geq 0$ and $c(H) > c(L)$. Advertising may be demand-enhancing ($D_A > 0$) or dissipative ($D_A = 0$). For $t \in \{L, H\}$, assume further that $\Pi(P, A, t)$ is strictly concave in P , with a unique maximizing pair, $(P_M(t), A_M(t))$. This pair denotes the monopoly price-advertising selection. The corresponding monopoly profit is $\pi_M(t) \equiv \Pi(P_M(t), A_M(t), t)$.

At the start of the post-entry period, a single entrant observes the pre-entry price and advertising level, but not the incumbent's type, and forms some belief $b = b(P, A) \in [0, 1]$ as to the probability that the incumbent has high costs. The entrant then enters or not, where $E = 1$ ($E = 0$) denotes (no) entry. If entry does not occur, then the incumbent earns monopoly profit $\pi_M(t)$ in the post-entry period. If entry does occur, then the entrant learns the incumbent's type, and the incumbent and entrant play some post-entry duopoly game, earning $\pi_D(t)$ and $\pi_D^e(t)$, respectively. The sunk cost of entry is embedded in $\pi_D^e(t)$.

For a given price P , advertising level A , entry decision E and incumbent type t , the incumbent and entrant payoffs are

$$V(P, A, E, t) = \Pi(P, A, t) + \delta[E\pi_D(t) + (1 - E)\pi_M(t)] \quad (7.13)$$

$$u(E, t) = \delta E\pi_D^e(t), \quad (7.14)$$

respectively, where δ is the common discount factor. At the time of the entry decision, the entrant's expected profit from entry is

$$U(P, A, E, b) \equiv [bu(E, H) + (1 - b)u(E, L)]/\delta. \quad (7.15)$$

Using (7.14) and (7.15), it follows that $U(P, A, 0, b) = 0$ and $U(P, A, 1, b) = b\pi_D^e(H) + (1 - b)\pi_D^e(L)$.

Further structure is provided by three key assumptions. First, whatever its type, the incumbent prefers that entry not occur: $\pi_M(t) > \pi_D(t)$. Second, the entrant earns positive profit from entry if and only if the incumbent has high costs: $\pi_D^e(H) > 0 > \pi_D^e(L)$. Third, the incumbent gains at least as much from entry deterrence when its costs are low as when its costs are high: $\pi_M(L) - \pi_D(L) \geq$

oretical counterpart to an interesting extension of Bain's approach that is offered by Williamson (1963). In Williamson's model, the incumbent deters entry, by making a pre-entry commitment to a low price and a high level of advertising.

$\pi_M(H) - \pi_D(H)$. The first assumption is unobjectionable, the second assumption holds in standard duopoly models if the sunk cost of entry falls in an intermediate range, and the third assumption reflects the differential benefit of greater sales to a lower-cost firm and holds in many popular duopoly models.

A Perfect Bayesian Equilibrium is a set of strategies $\{P(t), A(t), E(P, A)\}_{t=L,H}$ and beliefs $b(P, A)$ such that: (i). for each $t \in \{L, H\}$, $(P(t), A(t))$ maximizes $V(P, A, E(P, A), t)$, (ii). for all $(P, A) \geq 0$, $E(P, A)$ maximizes $U(P, A, E, b(P, A))$ and (iii). $b(P, A)$ is derived from the equilibrium strategies whenever possible. I again focus on separating equilibria. For such equilibria, $(P(H), A(H)) \neq (P(L), A(L))$ and thus $b(P(H), A(H)) = 1 > 0 = b(P(L), A(L))$. The entrant infers the incumbent's type and enters if and only if the incumbent has high costs. As the high-cost incumbent is "found out," it can do no better than to make its monopoly selection, $(P(H), A(H)) = (P_M(H), A_M(H))$, and then face entry.¹¹⁵ The high-cost incumbent thus receives the payoff $V(P_M(H), A_M(H), 1, H) \equiv V_M(H)$. Separation then requires that the low-cost incumbent choose some pair (P, A) that the high-cost incumbent would not mimic:

$$V(P, A, 0, H) \leq V_M(H). \quad (7.16)$$

To ensure that separation is costly, I assume that the low-cost incumbent's monopoly selection $(P_M(L), A_M(L))$ does not satisfy (7.16).

In the least-cost separating equilibrium, the low-cost incumbent makes the selection $(P(L), A(L)) = (P^*, A^*)$, where (P^*, A^*) is the price-advertising selection that solves the following program:

$$\underset{P,A}{Max} V(P, A, 0, L) \text{ subject to (7.16)}. \quad (7.17)$$

Bagwell and Ramey (1988) establish that the least-cost separating equilibrium exists. I focus here on the characterization of such an equilibrium.

To gain intuition, consider any two price-advertising pairs, (P_1, A_1) and (P_2, A_2) , that leave the mimicking high-cost incumbent indifferent. Since each pair deters entry, indifference means that $\Pi(P_1, A_1, H) = \Pi(P_2, A_2, H)$. Thus

$$\Pi(P_2, A_2, L) - \Pi(P_1, A_1, L) \quad (7.18)$$

¹¹⁵Suppose $(P(H), A(H)) \neq (P_M(H), A_M(H))$. Then the high-cost incumbent could achieve a strict gain with a deviation to $(P_M(H), A_M(H))$, since

$$V(P(H), A(H), 1, H) < V(P_M(H), A_M(H), 1, H) \leq V(P_M(H), A_M(H), E(\cdot), H),$$

where $E(\cdot) \equiv E(P_M(H), A_M(H))$. The final inequality follows, since $\pi_M(H) > \pi_D(H)$.

$$\begin{aligned}
&= [\Pi(P_2, A_2, L) - \Pi(P_1, A_1, L)] - [\Pi(P_2, A_2, H) - \Pi(P_1, A_1, H)] \\
&= [c(H) - c(L)][D(P_2, A_2) - D(P_1, A_1)].
\end{aligned}$$

As (7.18) reveals, given that $c(H) > c(L)$, the low-cost incumbent prefers the pair at which demand is highest. Intuitively, a demand-increasing change is more attractive to a low-cost incumbent, since the demand increase then translates into a smaller cost increase.

For further insight, consider the program given in (7.17). The Lagrangian is $L(P, A, \lambda) \equiv V(P, A, 0, L) + \lambda[V_M(H) - V(P, A, 0, H)]$. It may be verified that $\lambda \in (0, 1)$ at the optimum.¹¹⁶ Using (7.13), the Lagrangian may be re-written as

$$L(P, A, \lambda) = (1 - \lambda)\left\{\left(P - \frac{c(L) - \lambda c(H)}{1 - \lambda}\right)D(P, A) - \kappa A\right\} + K(\lambda, \delta), \quad (7.19)$$

where $K(\lambda, \delta)$ is independent of P and A . As the bracketed term in (7.19) reveals, in the least-cost separating equilibrium, the low-cost incumbent makes the same price-advertising selection as it would were its constant marginal cost known to be $c_2 \equiv [c(L) - \lambda c(H)]/(1 - \lambda)$. Observe that $\lambda \in (0, 1)$ implies $c_2 < c(L)$.

In the least-cost separating equilibrium, the low-cost incumbent thus undertakes a “cost-reducing distortion,” in that it selects the same price-advertising pair as it would were its costs known and lower than they truly are. Put differently, the low-cost incumbent behaves as it would were it a monopolist operating in a single-period setting with constant marginal cost $c_2 < c(L)$. It is natural to assume that a single-period monopolist would lower its price and raise its demand-enhancing advertising were its constant marginal cost of production reduced.¹¹⁷ Under this assumption, the low-cost incumbent distorts downward its price ($P^* < P_M(L)$) and upward its demand-enhancing advertising ($A^* > A_M(L)$). Intuitively, the low-cost incumbent undertakes these distortions in order to demonstrate its willingness to increase demand. Finally, dissipative advertising is not used as a signal, since it would never be used by an incumbent with known costs.

As in the Milgrom-Roberts model, profitable entry is not deterred in a separating equilibrium. The entrant infers the incumbent’s cost type and resists entry exactly when entry would be unprofitable (i.e., when the incumbent has low costs). The incumbent’s pre-entry behavior credibly reveals its cost type, however, only

¹¹⁶The proof is analogous to that given in footnote 90 for the product-quality signaling model.

¹¹⁷As observed in footnote 91, this assumption holds in each of the two examples discussed in Section 4.1.2.

when the low-cost incumbent distorts its pre-entry selection. In the least-cost separating equilibrium, the low-cost incumbent deters (unprofitable) entry by limit pricing and overinvesting in demand-enhancing advertising.

With these predictions at hand, it is interesting to revisit the relationships between advertising, profitability and entry (see Sections 3.2.2 and 3.2.3). The Bagwell-Ramey model predicts that greater incumbent advertising is associated with higher profitability and lower rates of entry. These predictions match closely those suggested by Comanor and Wilson (1967, 1974) and other persuasive-view advocates. The predictions, however, are not attributable to advertising-induced brand loyalty; instead, they arise because an efficient incumbent advertises more, earns more and faces less entry than would an inefficient incumbent. The Bagwell-Ramey model thus offers some support for the “superior efficiency” interpretation advanced by Demsetz (1973, 1974) and Nelson (1974b, 1975).

The basic model can be extended in several directions. Bagwell and Ramey (1990) suppose that the incumbent’s private information concerns the level of industry demand. The incumbent now deters entry by signaling that demand is low. They establish that a “demand-reducing distortion” occurs: the low-demand incumbent behaves as if it were a single-period monopolist but demand is lower than it truly is. Under natural assumptions, in the least-cost separating equilibrium, the low-demand incumbent’s price and demand-enhancing advertising are both distorted downward. Thus, entry deterrence entails limit pricing, whether the incumbent is privately informed of its costs or the level of industry demand; however, entry deterrence results in an underinvestment in demand-enhancing advertising when the incumbent is privately informed as to the level of industry demand. Bagwell and Ramey also consider the possibility that the incumbent may wish to signal that demand is high, so as to influence the entrant’s beliefs and accommodate entry in the most profitable manner possible. In this case, a “demand-increasing distortion” occurs, with the implication that the high-demand incumbent distorts upward both price and demand-enhancing advertising.¹¹⁸

The work described here also can be extended to analyze manufacturer-retailer relations. Suppose that a manufacturer has private information concerning the eventual demand for its new product. The retailer may wish to carry the manufacturer’s product only if the retailer believes that there is a high demand for this product. The manufacturer thus may wish to use its advertising expenditure and

¹¹⁸Bagwell and Ramey also provide propositions that characterize necessary features of refined pooling equilibria. But Albaek and Overgaard (1992a) show that, in fact, refined pooling equilibria fail to exist in this model.

(wholesale) price to signal to the retailer that demand is high. Following the logic just described, the manufacturer signals that it offers a high-demand product by engaging in a demand-increasing distortion, whereby it distorts upward both price and demand-enhancing advertising.¹¹⁹ This discussion provides a formal counterpart to a common argument expressed in earlier writings that a manufacturer uses heavy advertising to communicate its confidence in the new product to retailers. See, for example, Berreman (1943) and Chamberlin (1933, p. 121).

Finally, Linnemer (1998) offers an interesting extension, in which an incumbent firm has private information with respect to its product quality *and* production costs. He considers a two-period model, in which the incumbent's first-period price and dissipative advertising outlays are used by consumers to infer quality and by a potential entrant to infer costs. Specifically, the incumbent either has a low-quality product and low costs, a high-quality product and medium costs, or a high-quality product and high costs. Consumers know product quality in the second period, but they must infer it in the first period. The entrant knows the incumbent's product quality; however, the entrant does not know whether a high-quality incumbent has medium or high costs. The entrant wants to enter, unless the incumbent has a high-quality product that it produces at medium cost. The interesting point is that the high-quality incumbent with medium costs has a conflict. As in the static signaling model presented in Section 6.1, it is tempted to distort price upward in order to signal quality to consumers. But, as in the limit-pricing literature discussed just above, it is also tempted to distort price downward in order to signal that its costs are not high and thus that entry would not be profitable. In rough analogy with the Milgrom-Roberts (1986) model, given these conflicting considerations, the high-quality medium-cost incumbent may have no better option than to use a distorted price and a positive dissipative advertising expenditure when signaling its type. As in the Bagwell-Ramey (1988) model, the consequent overinvestment in advertising deters entry that is unprofitable.

¹¹⁹See Chu (1992) for a formalization of this extension, wherein the retailer learns demand if it decides to carry the incumbent's product. Albaek and Overgaard (1992b) suppose that the retailer carries the product but does not learn demand prior to setting the retail price. The retailer's beliefs then impact its price choice. Now, a manufacturer may undertake a demand-reducing distortion in order to signal that demand is low, as it thereby encourages the retailer to set a low price and hence mitigates the double-marginalization problem.

7.3. Summary

In summary, when the goodwill effect of advertising is informational, theoretical analyses indicate that an incumbent firm that seeks to deter entry may underinvest in pre-entry advertising. It is also possible that advertising generates a reputational goodwill effect, by reinforcing consumers' experiences with the established product and exacerbating informational product differentiation. I am not aware, however, of an equilibrium model of this kind. On the whole, the entry-deterrence effect of advertising is not strongly supported by the existing theoretical models that emphasize advertising's possible goodwill effects. Future work might endogenize the "noise effect" that is emphasized in earlier writings.

I also consider the possibility that the incumbent's pre-entry pricing and advertising behavior may signal its private information and thereby affect the entrant's expected profit from entry. When the incumbent has private information about its costs, a low-cost incumbent may limit price and overinvest in advertising, in order to signal its costs and thereby deter entry. On the other hand, if the incumbent has private information as to the level of industry demand, a low-demand incumbent may limit price and underinvest in advertising, in order to signal demand and thereby deter entry. The overinvestment finding provides some support for the entry-deterrence effect of advertising; however, it must be noted that entry is deterred only when it is intrinsically unprofitable. In other words, the low-cost incumbent's heavy advertising does not make entry unprofitable; rather, it reveals that entry would be unprofitable.

8. Empirical Analyses

While inter-industry studies offer useful descriptions of economy-wide empirical regularities, they often suffer from important endogeneity and measurement concerns (as detailed in Section 3) and ultimately fail to identify the underlying structural parameters that describe how individual markets work. As mentioned in the Introduction, the modern (second-group) empirical analyses of advertising increasingly use new data sets, which are often constructed at remarkably disaggregated levels, and emphasize consumer and firm conduct. Strategic theories of advertising (as reviewed in Sections 4-7) influence the specification of demand functions and supply relationships in these analyses. In this section, I offer a brief and non-technical review of this empirical literature.

8.1. Advertising and the Household

I begin with a group of empirical studies that examine the impact of advertising on brand purchase decisions. The studies utilize household brand purchase panel data and often household advertising exposure data. With such disaggregated data, it is possible to gain insight into the respective roles of advertising and experience in explaining household brand purchase behavior. Likewise, it is possible to better distinguish between the informative, persuasive and complementary effects of advertising.

How are such data obtained and analyzed? One approach is to use a controlled field experiment. In this way, Krishnamurthi and Raj (1985) examine the effect of an increase in advertising on the elasticity of demand for an unnamed frequently purchased brand. Household brand purchase data are obtained through panel diaries maintained by households in a test city over a 52-week pre-test period and a 24-week test period. Advertising exposure is controlled through a split-cable experiment: a test panel of families is connected to one cable while a control panel of families is connected to another cable, and then the level of (non-price) advertising for the brand is increased in the test period for the test panel. At the family-panel level, Krishnamurthi and Raj specify a log-linear demand for the brand, where the log of the (relative) price of the brand is interacted with a time (pre-test, test) dummy variable. They report that demand for the brand becomes significantly more inelastic in the test panel of families once advertising is increased.

Guadagni and Little (1983) advance an alternative approach. They obtain household brand purchase data through supermarket scanner data. These data include individual item sales and prices by store by week, promotional activities within the store, and histories of purchases for samples of households. The multinomial logit choice model of brand choice is well suited for the analysis of such data. Guadagni and Little illustrate the power of this approach, by using scanner data on 32 weeks of purchases of coffee by 100 households and estimating the parameters that govern consumers' optimal brand-size choices.

In the multinomial logit model, consumer i enjoys utility u_k^i from alternative k (i.e., a brand-size choice), where utility consists of deterministic and random components: $u_k^i = v_k^i + \epsilon_k$. Under an appropriate (extreme value) distributional assumption for ϵ_k , consumer i optimally chooses alternative k with probability

$$p_k^i = e^{v_k^i} / \sum_{j \in S^i} e^{v_j^i},$$

where S^i is the set of alternatives under consideration by consumer i .¹²⁰ Next, the deterministic term is decomposed into a linear combination of attributes that are associated with alternative k :

$$v_k^i = \sum_{j \in T} b_j x_{jk}^i,$$

where x_{jk}^i denotes the value of attribute j for consumer i under alternative k . The set T of attributes includes price, promotion and also brand and size experience measures.¹²¹ The econometrician observes consumer choices and attribute values and then estimates the b_j parameters using maximum likelihood methods.

How is brand experience measured? At the time of the n th coffee purchase of consumer i , the experience that this consumer has with the brand associated with brand-size alternative k is an attribute of this alternative that is measured as a weighted average of past purchases of the brand, where past purchases are treated as 0 – 1 variables.¹²² The experience variables are then initialized using household purchase observations for previous weeks. Using this approach, Guadagni and Little report that brand and size experience are the most important attributes in explaining consumer brand-size choice. Guadagni and Little do not have household advertising exposure data, however, and so their analysis leaves open an important question: What are the respective roles of advertising and experience in explaining household brand purchase behavior?

This question is the focus of subsequent work. For 251 households in a test city, Tellis (1988) obtains scanner data for purchases of 10 brands of toilet tissues over a 52-week period, and he also obtains TV meter records of household exposure to brand advertising. Tellis seeks to explain both brand choice and volume, where explanatory variables include brand experience, volume experience, advertising exposure and price. Like Guadagni and Little, Tellis uses purchase behavior in a pre-test period to develop experience measures. Using advertising exposure data, he is also able to assess the impact of advertising on brand choice and volume, both directly and interacted with experience. In line with Lambin's (1976) work,

¹²⁰See McFadden (1974).

¹²¹Measurements of past purchase behavior are also sometimes referred to as indicating brand (or size) loyalty.

¹²²Let $x_{bk}^i(n)$ denote the brand experience that consumer i has at the time of the n th purchase occasion for the brand associated with the brand-size alternative k . Then $x_{bk}^i(n) = \alpha_b x_{bk}^i(n-1) + (1 - \alpha_b) d_k^i(n-1)$, where $d_k^i(n-1)$ is a 0 – 1 dummy variable that takes value 1 if consumer i bought the brand associated with brand-size k at purchase occasion $(n-1)$. The smoothing constant α_b is selected by trial and then refined. Size experience is measured similarly.

Tellis reports that experience is the strongest determinant of purchase behavior, and that other marketing variables like price are more important than advertising. Advertising appears to have only a small effect on brand choice.¹²³ According to this evidence, pioneering firms may enjoy important experience-based advantages; however, advertising itself is not one of the more important determinants of purchase behavior.

These findings are evaluated in further work that uses scanner and advertising exposure data and multinomial logit models to explain household brand-choice behavior. Kanetkar, Weinberg and Weiss (1992), for example, consider the product categories of aluminum foil and dry dog food. Their explanatory variables include brand experience, advertising exposure and price. They also find that the direct impact of advertising appears small in comparison to other marketing variables like price. Examining the interaction of price with advertising exposure, they further report that increased advertising exposure is associated with greater brand choice price sensitivity. One interpretation is that advertising increases the “identifiability” of different brands and thereby promotes price comparisons.¹²⁴ Deighton, Henderson and Neslin (1994) consider ketchup and detergent. They find a large inertia (loyalty) effect, in the sense that a buyer is likely to purchase the same brand as was bought on the previous shopping trip. Allowing for interactions between previous purchase and advertising, they find that advertising does little to change the repeat-purchase probabilities of consumers that have just purchased the brand. Advertising can be effective, however, in attracting consumers who have not recently purchased the brand.

The studies above are published in marketing journals, but economists are now also conducting related analyses. Akerberg (2001) constructs a binary logit model to explain the household choice of whether to purchase a newly introduced yogurt product, Yoplait 150. Explanatory variables include previous purchase measures, advertising exposure, price and time. Advertising is also interacted with an experience variable, where a consumer is experienced (inexperienced) if he has (never) purchased Yoplait 150 in the past. Advertising’s effect on inexperienced consumers is positive and significant, whereas advertising has only a small and insignificant effect on experienced consumers. Akerberg also considers a specification in which experience is measured in terms of the number of previous purchases. He finds that the effectiveness of advertising declines as the consumer

¹²³Pedrick and Zufryden (1991) consider the yogurt product category. In comparison to Tellis’s (1988) study, they report a stronger direct effect of advertising exposure on brand choice.

¹²⁴This is in the spirit of Steiner’s (1973, 1978, 1984, 1993) work. See Section 3.2.4.

becomes more experienced (i.e., as the number of previous purchases increases).¹²⁵

The models described above endogenize consumers' current brand choices but are nevertheless "reduced form." Consumers' past purchases are regarded as exogenous data that generate a brand experience attribute with which to better explain current brand choices. On the other hand, in a "structural" empirical model, the consumers' dynamic choice problem is fully specified, and the parameters of the consumers' utility function and/or constraints are estimated. A structural model thus may offer greater insight into the process through which advertising affects consumer purchase behavior.

In Erdem and Keane's (1996) structural model, the utility that a consumer derives from the purchase of a brand is a function of the brand's attributes and a random component; however, for each brand there is now an attribute ("quality") whose value is uncertain and experienced with noise. The utility function is parameterized to allow that the consumer may be risk averse with respect to the experienced value of this attribute. The consumer seeks to learn the mean value of a brand's attribute, and the precision of the consumer's information may be improved by direct experience with the brand and observation of brand advertising messages. A forward-looking consumer thus may experiment and purchase a brand today, in order to acquire information. The method of simulated maximum likelihood is used to estimate parameters that describe the utility function and the precision of experience and advertising exposure signals, so as to best explain brand choices. Using scanner data and household advertising exposure data for different brands of laundry detergent, Erdem and Keane report that consumers are risk averse and that experience is much more informative than advertising. The model thus provides insight into *how* brand loyalty is formed: due to risk aversion, consumers are loyal to brands that have delivered positive use experiences.

Ackerberg (forthcoming) offers a related structural model of brand choice. In his utility specification, however, the consumer may be interested in observed advertising for two reasons. First, if a consumer's prior belief is that a brand's advertising intensity is positively associated with the value of its attribute, then observed brand advertising provides indirect (signaling) information as to the brand's attribute value. Second, if a consumer directly values the prestige effect that higher brand advertising intensity is perceived to imply, then greater observed

¹²⁵Shum (2000) reports similar findings in his study of household brand choice in the breakfast cereal category. His investigation uses scanner data for 50 brands of breakfast cereal combined with an aggregate measure of advertising exposure (namely, quarterly brand-level national advertising expenditures).

brand advertising is indicative of a higher direct utility from brand purchase. Using scanner data and advertising exposure data for Yoplait 150, Akerberg conducts a structural estimation. Identification of the informative and prestige effects is possible, since the informative (prestige) effect suggests that advertising affects the purchase probabilities of inexperienced (inexperienced and experienced) consumers. Akerberg reports that advertising has a large and significant informative effect and an insignificant prestige effect.¹²⁶

Finally, as Ippolito and Mathios (1990) illustrate, the effect of advertising on household purchase behavior also may be examined using event studies. They focus on the ready-to-eat cereal market. In response to growing evidence of fiber's potential cancer-preventing benefit, a regulatory ban against health-claim advertising by cereal producers was lifted in 1985. Using brand-level cereal consumption data, Ippolito and Mathios find that fiber cereal consumption increased significantly, once the ban on health-claim advertising was removed. They also use brand-level cereal consumption data for samples of individuals in 1985 (prior to most health-claim advertising) and 1986 (more than a year after health-claim advertising began). The household data suggest that advertising lowered the cost of acquiring health-related information for individuals who were not well reached by other health information sources.

In broad terms, the studies described above point toward a number of striking conclusions. For a set of frequently purchased consumer goods: (1) experience is a very important determinant of household purchase behavior; (2) advertising also influences household purchase behavior, but experience is the more powerful input; (3) advertising and experience are substitutes, in that advertising is less effective in influencing purchase behavior for households that have recent experience with the brand; and (4) much of advertising's effect derives from the information that it contains or implies. On the whole, the studies provide support for the informative

¹²⁶The studies above emphasize the effect of advertising on household purchase behavior for various consumer goods. By contrast, Shachar and Anand (1998) consider the effect of "tune-in" ads (i.e., TV ads in which a network advertises one of its own shows) on the TV viewing decisions of individuals. Viewers are assumed to possess greater prior information about the existence and attributes of regular shows than specials; thus, a differential effect of tune-in ads on viewing decisions across the two show categories may suggest that advertising has informational content. Using a Nielsen data set that records individual characteristics and viewing behavior, Shachar and Anand specify a nested multinomial logit model and report estimates indicating that a differential effect is indeed present. Anand and Shachar (2001) provide further support for the informative content of tune-in ads. Consistent with the models reviewed in Section 6.3, they provide evidence that advertising enables buyers to better match their respective tastes with the product attributes offered by different shows.

view of advertising.

The studies are of particular interest in light of the long-standing debate as to whether advertising deters entry. As discussed in Section 7.1, existing theory demonstrates that informational product differentiation may be a barrier to entry; however, the theoretical literature to this point does not identify a sense in which advertising “reinforces” consumers’ experience and exacerbates the informational barrier to entry. Likewise, the studies described above support the idea that consumer experience is an important asset for pioneering brands; however, they suggest that advertising itself does little to reinforce experience.

At the same time, it must be emphasized that the studies have important limitations. First, they focus on a narrow set of consumer goods. An important task of future work is to determine the extent to which the conclusions of these studies extend to other goods. Second, the studies treat price and advertising exposure as exogenous variables. This is a concern, since brand choice may depend upon attributes that are observable to market participants but unobservable to the econometrician. In this case, price and advertising exposure may be correlated with the error term.¹²⁷

8.2. Advertising and Firm Conduct

I consider next empirical studies that reflect the strong influence of the intervening theoretical work and emphasize firm conduct. Some studies adopt a reduced-form approach and evaluate the predictions of strategic theories of advertising, while others adopt a more structural approach and specify demand functions, cost functions and supply relationships.

Consider first the reduced-form studies that assess the predictions of strategic advertising theories. While some recent papers discussed in Section 3 report evidence that is relevant for the descriptive validity of intervening theoretical work, I illustrate this style of analysis here using papers by Thomas, Shane and Weiglet (1998) and Ellison and Ellison (2000). I do this for two reasons. First, these papers identify and assess predictions that are tightly linked with the intervening theoretical work. Second, it is useful to collect as many papers as possible in Section 3, so that the topic treatments found there may be more self contained.

Using auto industry data, Thomas, Shane and Weiglet assess the advertising-quality relationship. They provide evidence that models priced higher than the full-information price tend to have higher advertising levels. Referring to the

¹²⁷For further discussion, see Berry (1994), Villas-Boas and Winer (1999) and Nevo (2001).

Milgrom-Roberts (1986) model, the authors emphasize that this behavior is consistent with the hypothesis that manufacturers of high-quality models signal unobservable quality attributes by setting prices above full-information levels and advertising expenditures beyond those incurred by manufacturers of low-quality models.¹²⁸ The signaling interpretation is further supported by the finding that these relationships are weaker for older models. Finally, as the repeat-business effect suggests, they find that automobiles that experience higher sales five years after introduction are characterized by greater advertising in the introductory period. These findings are broadly consistent with Nelson's (1974b) reasoning, but he does not address the possibility that price and advertising serve as joint signals of quality. The predicted relationships between price and advertising are thus strongly influenced by the intervening theoretical work.

Ellison and Ellison (2000) consider the behavior of pharmaceutical incumbents in the period of time that precedes the loss of patent protection. The incentive to deter entry is greatest in intermediate-sized markets, since entry deterrence is unnecessary (impossible) in markets that are sufficiently small (large). For prescription drugs, incumbent advertising has a public-good aspect, in that some of the benefits may accrue to generic entrants; thus, an incumbent operating in an intermediate-sized market has a potential incentive to reduce advertising and thereby reduce the profitability of entry. This rationale for diminished advertising is weakened in larger markets, as the incumbent's focus switches from deterrence to accommodation. Arguing in this way, Ellison and Ellison build on intervening theoretical work (e.g., Fudenberg and Tirole (1984)) and offer a novel prediction: advertising may be reduced most rapidly in years prior to patent expiration in markets of intermediate size. Using data on 63 drugs that faced patent expirations over 1986-1992, they also report evidence that supports this prediction.

Consider next empirical studies that follow the methodology of the "new empirical industrial organization" (NEIO) and adopt a more structural approach. It is instructive to contrast the NEIO approach with the earlier structure-conduct-performance paradigm (SCPP) that underlies the inter-industry studies of Bain (1956), Comanor and Wilson (1967, 1974) and followers. In broad terms, the SCPP makes two assumptions: (1) across large groups of industries, a stable and

¹²⁸Specifically, the authors first regress model i 's price at time t on the model's observable quality attributes (horsepower, etc.) and other variables. The residual is interpreted as capturing deviations from the full-information price that are due to unobservable quality attributes. Second, they regress the advertising level for model i at time t on the corresponding price residual (and other variables). A positive coefficient is consistent with the described hypothesis.

causal relationship runs from exogenous structural characteristics through conduct to performance; and (2) market-power measurements of performance may be calculated from available (e.g., accounting profit) data. As Bresnahan (1989) explains, the NEIO is distinguished from the SSCP in several respects. Among these are: (1) the assumption of symmetry across industries is abandoned, and instead an econometric model of a single industry (or a closely related set of markets) is developed; (2) market power is not treated as observable, and instead the analyst infers marginal cost from firm behavior; and (3) firm and industry conduct are not treated as simple implications of market-structure variables, and instead the analyst specifies behavioral equations that are based on theoretical models and uses estimates to test between models.

The standard NEIO analysis has three basic ingredients.¹²⁹ First, demand functions are specified. For example, a firm's output may be a linear function of own and rival prices as well as exogenous demand variables like income. Second, marginal cost functions are specified. A firm's marginal cost might be a linear function of its output and exogenous cost variables like input prices, for instance. Third, supply relationships are specified. A firm's supply relationship corresponds to a first-order condition for optimizing behavior. Once the marginal cost functions are substituted into the firms' respective supply relationships, the demand functions and supply relationships constitute an econometric system of equations, in which outputs and prices are endogenous variables, and the demand, marginal cost and any conduct parameters may be estimated.

How are the supply relationships specified? Under one approach, the supply relationships include a conjectural variations or conduct parameter that is estimated as a continuous variable. Under appropriate conditions, the conduct parameter can be identified, and a performance inference thereby obtained.¹³⁰ The conjectural variations approach includes as special cases a number of hypotheses as to firm behavior. The analyst may then test among these hypotheses using nested methods. But the approach also has limitations: the estimated conduct parameter may not correspond to any particular model of firm behavior, and some interesting types of behavior (such as asymmetric collusion) may not be included as special cases. An alternative approach is to consider a menu of models. For example, the Bertrand, Stackelberg and Collusive models imply distinct supply relationships that may be individually considered. Under the menu approach, the

¹²⁹See Bresnahan (1989), Church and Ware (1999) and Kadiyali, Sudhir and Rao (2001).

¹³⁰The conjectural variations approach is pioneered by Iwata (1974). See Nevo (1998) and Corts (1999) for discussion of identification problems under the conjectural variations approach.

analyst may test among models using non-nested methods and then emphasize parameter estimates for the preferred model.

Some recent NEIO studies include advertising as an endogenous variable. The models are more complex than the preceding discussion. Each firm now may have multiple choice variables; furthermore, if a goodwill effect is allowed, then the demand functions and supply relationships must be dynamic. If the conjectural variations approach is adopted, then dynamic conduct parameters may be specified and estimated, where such parameters indicate a firm's perception as to how a change in its current behavior would alter rival behavior in the future. The identification of structural parameters then requires that some restrictions be placed on the dynamic conduct parameters. Finally, it is desirable that the specification of demand functions be sufficiently flexible to include the primary (market-size) and selective/combatative (market-share) effects of advertising.

Roberts and Samuelson (1988) offer an early study of this general nature. They develop an analysis of dynamic non-price rivalry among U.S. cigarette manufacturers in high- and low-tar cigarette markets over the 1971-82 period.¹³¹ The demand functions are specified in a multiplicatively separable fashion that facilitates the identification of the market-size and market-share effects of advertising. Making use of factor demand data, Roberts and Samuelson estimate marginal costs directly.¹³² Finally, the supply relationships are captured as dynamic first-order conditions for firms' goodwill choices, where a firm's dynamic conduct parameter is restricted to describe the extent to which an increase in the firm's goodwill stock at date t would induce rivals to increase their goodwill stocks in period $t + 1$. Their estimates suggest that advertising is not combative; in fact, advertising in new-product categories (i.e., in the low-tar market) appears to expand market sizes and constitute a public good among firms. They further report that the estimated dynamic conduct parameters are negative. Evidently, firms are not naive: each recognizes that an increase in its own advertising would encourage less (market-size-expanding) advertising from rivals in the future.

Using data on the Coca-Cola and Pepsi-Cola markets over the 1968-86 period,

¹³¹Cigarette advertising was banned from TV and radio over this period, but substantial advertising expenditures were made in magazines, newspapers and outdoor media.

¹³²The approach here is to specify a total cost function, use Shephard's lemma to derive a system of factor demands and then estimate the parameters of this system. With the cost parameters thus estimated, the estimated value of marginal cost can be determined as a function of input prices and output volumes. See Bresnahan (1989, pp. 1039-40) for discussion of the strengths and weaknesses of this approach relative to the alternative approach mentioned previously, whereby marginal cost is inferred from the supply behavior of firms.

Gasmi, Laffont and Vuong (1992) illustrate the menu approach. They specify a demand function for each product, where sales depend on own and rival price and advertising selections. The demand specification presumes that advertising has no goodwill effect. Marginal cost is constant at a value that is specified to be linear in input prices. Using the demand and cost specifications, they then turn to the supply relationships and derive first order conditions for each firm in price and advertising, where the parameters of these conduct equations take different restrictions as different oligopoly games (Nash in prices and advertising, Nash in prices and collusion in advertising, etc.) are considered. For any given game, the two demand and four conduct equations can be simultaneously estimated, where the six endogenous variables are the prices, advertising levels and quantities of the two firms. After determining the best-fitting game, the authors then emphasize the associated parameter estimates. Their analysis suggests that Coca-Cola was a Stackelberg leader in price and advertising until a mid-sample period (1976). After this period, duopoly conduct is characterized by collusion in advertising and possibly price. In this context, their estimates suggest that advertising in the cola market is largely combative.

This approach is also used by Kadiyali (1996), who analyzes the U.S. photographic film industry. In the 1970s, Kodak had a virtual monopoly of this industry; however, Kodak accommodated entry by Fuji in the 1980s. Kadiyali refers to 1970-1980 (1980-1990) as the pre-entry (post-entry) period. She specifies a demand function and a constant marginal cost for each firm, and then considers the two periods separately. In the pre-entry period, only Kodak is active, and the supply relationship is described by Kodak's pricing and advertising first-order conditions. In the post-entry period, the supply relationship is described by pricing and advertising first-order conditions for both firms, where the parameters of these conditions assume different restrictions as different post-entry games are considered. Kadiyali's parameter estimates for the pre-entry period indicate that Kodak maintained its monopoly position by using limit pricing and high advertising. As in the Bagwell-Ramey (1988) model, a possible interpretation is that Kodak reduced price and raised advertising in order to signal low costs. Kadiyali's estimates for the post-entry period suggest several conclusions, including: (1) Kodak was compelled to accommodate Fuji by 1980, since Fuji enjoyed demand and cost advantages; (2) Kodak and Fuji then colluded in price and advertising, putting a large weight on Fuji's profit; and (3) advertising expanded market size and constituted a public good across firms.

Finally, Slade (1995) develops a dynamic "state-space" approach with which

to study price and advertising brand rivalry. In this formulation, firms adopt Markov strategies that determine price and advertising behavior, given the current state of play. The empirical model is described by demand and strategy equations. The endogenous variables of the strategy equations are the size and probability of price and advertising changes, while the exogenous variables include factor prices (costs) and past endogenous choices (goodwill). Using weekly price, sales and advertising data for four brands of saltine crackers sold in grocery stores in a small town, Slade obtains estimates suggesting that a brand's sales are decreasing (increasing) in own price (advertising) and increasing (decreasing) in rival-brand price (advertising). Advertising is thus combative, but it has an overall positive effect on market size. Given the specification of linear demand and costs, the demand coefficient estimates may be used to draw inferences about the strategic environment. Slade reports cross-brand evidence that advertising efforts are strategic substitutes, prices are strategic complements, and low prices and high advertising make a brand "tough" (i.e., reduce rival-brand profits). In the dynamic game, firms thus compete aggressively in advertising and accommodate when setting prices, but the resulting high prices do not reflect collusive behavior.¹³³ A further implication is that entry-detering behavior would involve limit pricing and high advertising.

Placing firm conduct at centerstage, the empirical studies reviewed here are strongly influenced by the intervening theoretical work. While the NEIO analysis of advertising is just getting underway, it is already clear that one conclusion of the earlier empirical work is retained: the effects of advertising vary importantly across markets. The recent work also generates some interesting specific findings. First, in some markets, there is evidence that firms choose advertising in a collusive manner. This contrasts with a common view that firms compete aggressively in non-price variables, although support for the common view is found in other markets. Second, while advertising is often combative, there is also some support for the market-size effect (e.g., in new-product categories). Finally, some studies offer new evidence that limit pricing and high advertising may deter entry. While these are interesting findings, the primary contribution of the existing NEIO advertising studies is methodological. The studies reviewed here pave the way for what should be an active and valuable research area in the coming years.

¹³³Nevo (2001) draws a similar conclusion in his analysis of the ready-to-eat cereal industry. See also Vilcassim, Kadiyali and Chintagunta (1999).

8.3. Summary

The research described here constitutes an important advance in the empirical analysis of advertising. While the earlier inter-industry analyses searched for evidence of general causal relationships from structure to performance, the studies reviewed above emphasize the limitations of the inter-industry approach and instead use new disaggregated data sources to explore household and firm conduct. One set of studies examine purchase decisions, using household-level brand-purchase and advertising-exposure panel data. These data offer a remarkable opportunity to study a long-standing and fundamental question in the economic analysis of advertising: Does advertising reinforce consumer experience and insulate pioneering firms from entry? A second set of studies integrate game-theoretic models of advertising into the empirical investigation. Some studies examine the descriptive validity of the models, while others implant a model of the supply relationship into the system of equations that is to be estimated. These studies offer a window into the strategic conduct of firms.

9. Sunk Costs and Market Structure

As Sections 5 through 7 reveal, an important lesson of game-theoretic models in industrial organization is that details may matter. Empirical efforts that follow the SCPP and seek inter-industry confirmation of sweeping causal hypotheses are thus too ambitious. But what are the alternatives? As illustrated by the NEIO studies reviewed in the previous section, one alternative empirical strategy is to focus on a particular industry, where more details are observed and the theory imposes tighter restrictions. As Sutton (1991) emphasizes, a second strategy is to cull from the game-theoretic models a few robust implications and then examine those implications at inter-industry and industry levels. In this section, I provide a brief review of work by Sutton and others that follows this second strategy.¹³⁴

9.1. Main Ideas

Sutton develops robust predictions that concern the manner in which the endogeneity of sunk costs and the “toughness of price competition” influence the relationship between market size and concentration.¹³⁵ To this end, he models

¹³⁴For further discussion, see Bresnahan (1992), Schmalensee (1992), Sutton (1997a) and Sutton’s contribution to this volume.

¹³⁵Sutton’s analysis builds on that in Shaked and Sutton (1983, 1987, 1990).

industry equilibrium in terms of a multi-stage game, in which firms enter, sink costs, and then compete (e.g., in prices) in the product market. Considerable latitude is allowed as to whether firms sell horizontally or vertically differentiated products, move sequentially or simultaneously within given stages of the game, sell single or multiple products, or choose prices or outputs.

Sutton distinguishes between two categories of industries. In an *exogenous sunk cost industry*, the only sunk costs are exogenous setup costs. These are the costs of acquiring a single plant of minimum efficient scale and perhaps advertising at some threshold level. An exogenous sunk cost industry may be an industry with homogeneous or horizontally differentiated goods, for example. In an *endogenous sunk cost industry*, by contrast, a firm incurs advertising (or R&D) outlays which result in an enhanced demand for that firm's product in the subsequent stage of product-market competition.¹³⁶ As in the first example described in Section 4, an industry is characterized by endogenous sunk costs if products are vertically differentiated as a consequence of brand-image advertising, for instance. Sutton is not concerned with the reason that advertising works in such an industry; rather, he assumes that it does and then examines the implications.

Consider first the case of an exogenous sunk cost industry. To illustrate the key predictions, imagine that firms sell products that are differentiated in a symmetric sense, so that the equilibrium price when N firms enter may be represented as $p(N | \theta)$, where θ denotes the toughness of price competition.¹³⁷ For example, θ may correspond to transportation costs or competition policy. A firm's cost function is $C(q) = cq + \sigma$, where $\sigma > 0$ denotes the exogenous setup costs that are associated with entry. An increase in the market size $S > 0$ is accomplished through successive replications of the consumer population. This ensures that the distribution of tastes is not altered, so that the equilibrium price does not depend directly upon market size. Ignoring the setup cost σ , it is then possible to denote a firm's equilibrium gross profit function as $S\Pi(N | \theta)$. In most such models, $p(N | \theta)$ is nonincreasing in N and $p(N | \theta) > c$ for all N .¹³⁸ Assume then that $\Pi(N | \theta)$ is positive and decreasing in N , with $\Pi(N | \theta) \rightarrow 0$ as $N \rightarrow \infty$. The equilibrium level of entry is determined by $S\Pi(N | \theta) = \sigma$.

Using this example, two predictions can be described. First, as market size S

¹³⁶The analysis is extended to include endogenous R&D sunk costs in Sutton (1997b, 1998). For an early analysis of this kind, see Dasgupta and Stiglitz (1980).

¹³⁷For example, Dixit and Stiglitz (1977), Shubik and Levitan (1980) and Sutton (1997a, 1998) provide models of this kind. My discussion here follows that in Sutton (1997a).

¹³⁸An exception is the case of Bertrand competition with homogeneous goods. In this case, only one firm enters, regardless of market size.

increases indefinitely relative to the setup cost σ , the equilibrium concentration, measured as $1/N$, converges monotonically to zero. Intuitively, an increase in market size always raises profit and invites further entry, where the additional entry restores the zero-profit requirement by reducing each firm's market share without increasing its markup. Economies of scale thus become unimportant as a barrier to entry in markets that are sufficiently large. The second prediction concerns the effect of an increase in the toughness of price competition. An increase in θ is associated with a reduction in $p(N | \theta)$. Assume then that $\Pi(N | \theta)$ is decreasing in θ . Under this assumption, a second prediction follows: an increase in the toughness of price competition shifts the equilibrium concentration upward. This simply reflects the familiar intuition that fewer firms can enter in a zero-profit equilibrium, when price competition is more vigorous.

As Sutton discusses, the main features of this example generalize across a wide range of models. In some of these models, multiple equilibria may arise. For example, if products are horizontally differentiated, then there may exist many single-product firms or a smaller number of multi-product firms. The functional relationship just described between concentration and market size is thus replaced by a lower bound relation. More generally, as Sutton (1991, p. 308) states, the two robust predictions for exogenous sunk cost industries are: (i) the function that gives the lower bound to equilibrium concentration converges monotonically to zero as market size increases; and (ii) this lower bound shifts upward, in response to an increase in the toughness of price competition. These predictions are illustrated in Figure 5a.

Consider second the case of an endogenous sunk cost industry. As Sutton (1991, p. 47) puts it, the main point is then as follows:

“If it is possible to enhance consumers' willingness-to-pay for a given product to some minimal degree by way of a proportionate increase in *fixed* cost (with either no increase or only a small increase in unit variable costs), then the industry will not converge to a fragmented structure, however large the market becomes.”

As this quotation suggests, in endogenous sunk cost industries, the negative relationship between concentration and market size breaks down.

Formally, suppose that a firm's product is described in terms of a single vertical attribute, u , where the willingness-to-pay of all consumers is increasing in u . In an endogenous sunk cost industry, a firm's advertising expenditures may affect its brand image and thus u ; therefore, let the advertising response function, $A(u)$,

indicate the sunk expenditure that a firm must incur in order to achieve u , where $A(u)$ is non-negative and increasing. A firm's total fixed cost expenditure is then $F(u) = A(u) + \sigma$. Let $c(u) \geq 0$ denote the firm's unit cost of production. Now, assume that there exist constants $\alpha > 0$ and $K > 1$ such that by incurring K times more fixed costs than any of its rivals, a firm will achieve a final stage (i.e., gross) profit that is no less than αS , where S corresponds to total consumer expenditure in the market. This assumption can be understood as embodying two features: (i) a sufficiently high attribute implies a certain minimal level of profit in the final stage (i.e., $c(u)$ does not increase too quickly with u), and (ii) a certain large increase in fixed advertising expenditures translates into a sufficiently high attribute (i.e., $F(u)$ is increasing and continuous, with an elasticity that is bounded above). Under this assumption, as Sutton (1991, pp.73-4) establishes, a non-convergence property is implied: there exists some $B > 0$ such that some firm must enjoy at least a fraction B of total industry sales at any subgame perfect equilibrium, independent of the size of the market.¹³⁹

The proof is instructive and simple. For a given equilibrium, let \bar{u} denote the highest value of u offered by any firm, and let \bar{m} denote the highest share of industry sales enjoyed by any firm. The profit in the final stage to any firm clearly cannot exceed $\bar{m} S$. Hence, if the firm that offers \bar{u} is to earn non-negative profit in the game, then it is necessary that

$$\bar{m} S \geq F(\bar{u}). \quad (9.1)$$

Now suppose a firm were to deviate and advertise to such an extent as to incur fixed costs in amount $KF(\bar{u})$. Using the assumption stated above, the deviant firm enjoys net profit that is at least

$$\alpha S - KF(\bar{u}). \quad (9.2)$$

Using (9.1) and (9.2), it follows that the deviant firm earns at least $\alpha S - K \bar{m} S = [\alpha - K \bar{m}]S$. Of course, in equilibrium, a firm cannot earn net profit in excess of

¹³⁹The proof below is developed for a three-stage game between single-product firms, in which firms enter, sink costs and then compete, with simultaneous moves in each stage. In some settings, equilibria may fail to exist, and so only the necessary features of equilibria are characterized. As Sutton explains, the proof may be applied to a variety of related games. For example, if firms sink costs sequentially within the second stage of the game, then the proof applies once the deviant firm is identified as the firm that comes last in the sequence. See Sutton (1997b, 1998) for further discussion of such games.

$\bar{m} S$. Therefore, an equilibrium exists only if $\bar{m} S \geq [\alpha - K \bar{m}]S$, or equivalently,

$$\bar{m} \geq \frac{\alpha}{1 + K} \equiv B. \quad (9.3)$$

Thus, as (9.3) confirms, regardless of the size of the market, in any equilibrium the maximal market share must exceed the constant B .

Intuitively, under the assumption that a given proportionate increase in a firm's advertising outlay relative to that of rivals can induce some fixed fraction of consumers to purchase that firm's product at a price that exceeds the firm's unit variable cost, a fragmented market structure cannot stand: some firm would deviate with a large advertising outlay and earn greater profit. In equilibrium, as market size increases, the tendency toward fragmentation is offset by a competitive escalation in advertising outlays. This suggests that the relationship between market size and concentration may be non-monotonic. Sutton provides some examples in support of this suggestion. In summary, two robust predictions for endogenous sunk cost industries are that the lower bound to equilibrium concentration (i) is bounded away from zero as market size increases, and (ii) is not necessarily monotonic in market size.¹⁴⁰ Figure 5b illustrates.

9.2. Econometric Tests and Industry Histories

Sutton (1991) next confronts the predictions of the theoretical analysis with a careful analysis of twenty narrowly defined food and drink manufacturing industries across six countries.¹⁴¹ He divides the industries into two groups. In the first group, firms sell homogeneous products, and advertising outlays are very low. The homogeneous-goods industries are examined in light of the theoretical predictions for exogenous sunk cost industries. In the second industry group, advertising outlays are moderate to high. The advertising-intensive industries are thus analyzed with reference to the theoretical predictions for endogenous sunk cost industries. Cross-country comparisons afford the necessary variation in market size.

The empirical effort begins with a cross-sectional econometric analysis of observed concentration levels. The empirical regularities that Sutton uncovers are consistent with the predictions of the theory. In the group of homogenous-goods industries, he reports a strong negative correlation between (four-firm) concentration and the ratio of market size to setup cost, S/σ . He observes further that

¹⁴⁰Sutton (1991, p. 308) mentions further the robust prediction that an increase in setup cost (σ) results in an increase in the lower bound for concentration.

¹⁴¹The six countries are France, Germany, Italy, Japan, the U.K. and the U.S..

the minimal levels of concentration found at large values of S/σ are very small (below 5%). By contrast, in the advertising-intensive group, the lowest level of concentration is 25%. Several of these industries also have large values of S/σ . Bounds regression analysis offers further support for the predictions of the theory.

With the inter-industry statistics in place, Sutton next presents a remarkable set of industry studies. Interesting on their own, these studies offer further opportunities for assessing the theory. For example, in his discussion of homogeneous-goods industries, Sutton considers the salt and sugar industries and identifies international differences in competition policy that suggest variation in the toughness of price competition. This variation facilitates an examination of the prediction that, for exogenous sunk cost industries, tougher price competition is associated with more concentrated markets. Broadly, the industry experiences are consistent with this prediction. Likewise, within the group of advertising-intensive industries, Sutton offers convincing qualitative support for the main theoretical ideas. For example, consistent with the hypothesis of a lower bound, in the frozen food industry, a wave of new entry resulted in a fragmentation of the market that sparked a competitive escalation in advertising outlays by leading firms, leading back to a more consolidated structure. Finally, Sutton's case studies also confirm that details matter. Above the lower bound, a rich array of strategic interaction is observed.

9.3. Related Work

Sutton's research is related to several strands of work that are discussed above. I describe here four such relationships. I then mention some recent work that extends Sutton's theoretical and empirical analyses.

Consider first the inter-industry studies of advertising and concentration. As discussed in Section 3.2.1, while the advertising-concentration relationship is central to Kaldor's arguments and the focus of a number of inter-industry studies, the relationship has defied a simple characterization. Sutton (1991, pp. 125-8) explains that his work encompasses a possible interpretation: if the relationship between market size and concentration varies in kind between homogeneous goods and advertising-intensive industries, then the earlier studies, which use pooled data and ignore this switch of regime problem, are misspecified. This interpretation explains further why such studies occasionally report a positive and significant relationship between advertising intensity and concentration. Consistent with Sutton's theory, suppose that (i) a negative (null) relationship exists between concen-

tration and market size for the homogeneous goods (advertising-intensive) group, and (ii) the mean level of concentration is higher in the advertising-intensive group. Under this supposition, if pooled data are used and concentration is regressed on the market size/setup cost ratio and advertising intensity, then a positive coefficient is expected on the advertising intensity variable.

Second, while Sutton studies manufacturing industries, similar relationships may also emerge in retail industries. As discussed in Section 3.2.4, some evidence suggests an association between advertising and the growth of large-scale retail firms. Consider the retail eyeglass industry. In the 1960s, considerable variation existed across states in the U.S. with respect to the legal restrictions imposed on advertising in the retail eyeglass industry. Depending on the scope of other sunk cost outlays, it may be appropriate to regard a retail eyeglass market as characterized by exogenous (endogenous) sunk costs when advertising is (not) restricted in the corresponding state. Interestingly, work by Benham (1971) and others (see footnote 57) suggests that large-scale retail firms operated in states that permitted advertising. Likewise, as Steiner (1978) and Pashigian and Bowen (1994) argue, the growth in manufacturer brand advertising, instigated by the emergence of TV and the growth in (relative) earnings by females, may have substituted for retail service and facilitated the emergence of a more concentrated retail market structure.

In this context, it is also interesting to contrast Sutton’s theoretical approach with that of Bagwell and Ramey (1994a). As discussed in Section 5.3, Bagwell and Ramey explore a multi-stage model of retail competition, in which firms first enter and then make their advertising, pricing and (cost-reduction) investment decisions. It is straightforward to extend their model to include a market size variable, S , corresponding to the total mass of consumers. If advertising is banned, a zero-profit (“random”) equilibrium obtains, in which each of the n entering firms sells to S/n consumers. As in Sutton’s exogenous sunk cost industries, the market fragments as S gets large. On the other hand, when advertising is endogenous, a zero-profit (“advertising”) equilibrium obtains, in which entering firms make heterogeneous decisions. As in Sutton’s endogenous sunk cost industries, the market does not fragment as S gets large.¹⁴²

Third, Sutton’s multi-stage approach, in which advertising outlays are sunk

¹⁴²In particular, the highest-advertising firm achieves a share of industry sales that is bounded from below by the fraction of informed (i.e., advertising-responsive) consumers, I . See also Bagwell, Ramey and Spulber (1997), who offer a related dynamic model of price competition that describes the evolution of a concentrated retail market structure.

prior to price competition, may be questioned in light of the empirical studies discussed in Section 3.1.1, which find that the effects of advertising on sales are often brief. While this concern has some merit, it should be noted that the no-fragmentation prediction for advertising-intensive industries may also hold when advertising outlays do not precede price choices. Using a variant of the Schmalensee (1976b) model of advertising competition, Schmalensee (1992, pp. 130) suggests that this prediction may be maintained whenever market share is “sufficiently sensitive to variations in *fixed* costs, so that rivalry is both tough and focused on fixed outlays, not on per-unit price-cost margins.”¹⁴³

Fourth, it is interesting to compare Sutton’s theoretical findings with the persuasive-view (see Section 2) and game-theoretic (see Section 7.2) examinations of advertising’s entry-deterrence effect. Sutton offers some support for the entry-deterrence effect, in that the scope for profitable entry is limited when advertising expenditures escalate. At the same time, it must be noted that Sutton does not offer a theory in which an incumbent firm strategically advertises at a high level in order to deter subsequent entry. In fact, advertising follows the entry choice in Sutton’s basic model, so that it is the expectation of future advertising rivalry that restrains entry.

Sutton’s theoretical and empirical analyses has been extended in several recent efforts. Symeonidis (2000a) considers the theoretical effect of tougher price competition on concentration in endogenous sunk cost industries. When price competition is tougher, final-stage profits are reduced, giving firms less incentive to sink advertising expenditures in the penultimate stage. As both gross profit and sunk costs are then lower, the overall effect on net profit may be ambiguous. As a general matter, then, in industries with endogenous sunk costs, an increase in the toughness of price competition has a theoretically indeterminate effect on concentration. In recent empirical work, Symeonidis (2000b) examines the evolution of concentration in U.K. manufacturing industries following a change in competition law that prohibited price-fixing agreements. The resulting increase in the toughness of price competition is associated with greater concentration in exogenous and even endogenous sunk cost industries. The relationship between concentration and market size is negative in exogenous sunk cost industries, and the relationship breaks down in industries with high advertising. These findings are consistent with Sutton’s predictions. Other supportive empirical studies of manufacturers are offered by Matraves (1999), who examines the global pharma-

¹⁴³Likewise, in the Bagwell-Ramey (1994a) model, a no-fragmentation prediction occurs, even though advertising and pricing decisions are simultaneously made.

ceutical industry, and Robinson and Chiang (1996), who use PIMS data. Finally, Ellickson (2001a,b) considers the application of Sutton's methodology to the retail supermarket industry. He reports that endogenous sunk costs associated with investments in store size and information and distribution networks are an important source of concentration in this retail market.

9.4. Summary

Sutton's innovative effort contributes importantly at both methodological and substantive levels. Methodologically, Sutton demonstrates an eclectic approach that evaluates game theoretic models by employing traditional inter-industry (SCPP) and recent industry-study (NEIO) empirical methods. This approach invites theorists to explicitly distinguish between the robust and particular implications of their models. Robust implications, such as those associated with the lower bound, may be examined using traditional inter-industry regressions. But there is also a rich set of observed behaviors that occur above the lower bound. The specific experiences of a given industry can be further interpreted using particular strategic models, historical analyses and recent industry-study methods. At the substantive level, Sutton convincingly makes the fundamental point that endogenous sunk costs in the form of advertising outlays often play a critical role in the evolution of market structure. The role of (brand and retail) advertising in the evolution of concentrated retail structures represents a promising direction for future research.

10. Other Topics

Despite the length of this survey, many topics are not treated or treated only briefly. In this section, I mention some of these topics and suggest a few papers for further reading.

First, I give little attention to the media and the market for advertising. As noted in Section 2, advertising and entertainment are often jointly supplied to the consumer. Advertising may be a nuisance (a bad) that consumers tolerate in order to enjoy programs and magazines, for example. From this perspective, a firm in the media industry produces an audience, which it then sells to advertisers. At a theoretical level, it is clearly important to integrate the positive and normative analyses of advertising into a larger market framework, which includes the media industry and the value to consumers of media entertainment. Anderson and Coate

(2002) and Nilssen and Sorgard (2000, 2001) provide interesting recent analyses of this kind. Related empirical issues also warrant mention. For example, Berry and Waldfogel (1999) examine the possibility that a business stealing externality leads to excess entry in the radio broadcasting market. Likewise, Seldon, Jewell and O'Brien (2000) and Silk, Klein and Berndt (2001) offer recent studies of the substitutability across different media of the demand for advertising, while Silk and Berndt (1993, 1995) study the production of advertising and estimate the cost structure of advertising agencies.

Second, as e-commerce retailing grows and information technologies advance, it becomes increasingly feasible for sellers to send specific ads and prices to buyers with specific purchase histories. Research on targeted advertising and price discrimination is thus of particular importance. Several recent studies of this kind are briefly mentioned in Section 5 (see footnote 76).

Third, I largely ignore the literature that considers the economic consequences of laws against deceptive advertising. Pitofsky (1978) describes the rationale behind the government regulation of truth-in-advertising. Sauer and Leffler (1990) provide an empirical assessment of the implications of such regulation for advertising content. In a recent theoretical effort, Barigozzi, Garella and Peitz (2002) show that laws concerning the veracity of comparative advertisements can enhance the signaling potential of advertising.

Finally, I completely ignore many aspects of advertising that are emphasized in other social sciences. Advertising plays an important role in political contests, for example. For recent work of this kind, see Coate (2001) and Pratt (2002). Likewise, the success of a given ad hinges on important psychological considerations that are not considered here.

11. Conclusion

This survey is written with two objectives in mind. A first objective is to summarize the economic analysis of advertising in a way that brings to the surface the more essential contributions and thereby clarifies *what* is known. To this end, I describe these contributions and summarize the main theoretical and empirical findings. These summaries are found at the close of the various sections (and subsections) above.

The second objective is to clarify *how* this knowledge has been obtained. Throughout the last century, advertising has provided the field with a number of important and difficult questions, including: Why do consumers respond to

advertising? Does advertising reinforce consumer experiences and deter entry? What is the relationship between advertising and concentration, profit, price and quality? Does the market provide too much advertising? With every methodological innovation in the field of industrial organization, economists have turned to these and other questions, demonstrating the additional insight that their new approach affords. In effect, advertising represents a case study with which to assess the progress gained as industrial organization methods have evolved.

But has progress been achieved? As a body, the research summarized in this survey makes a strong case for an affirmative answer. The progress achieved takes several forms. In some cases, progress is destructive in nature, as when recent studies reject the simplistic and often absolutist conclusions put forth by some key early contributors. In other cases, progress is constructive and reflects the discovery of new evidence and the generation of novel insights. Finally, with the development of new data sets and advances in econometric techniques and theoretical models, substantial progress is evident at a methodological level. At the same time, one must not get carried away. While much has been learned, the economic implications of advertising are subtle and controversial, and many of the most important questions remain unresolved.

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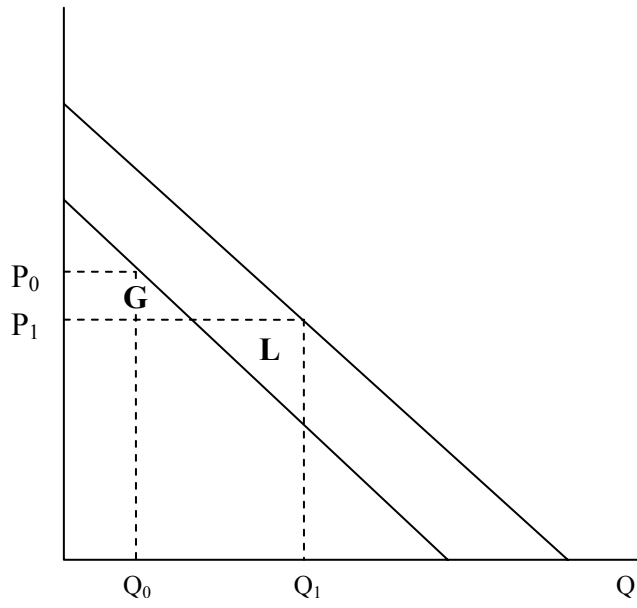


Figure 1

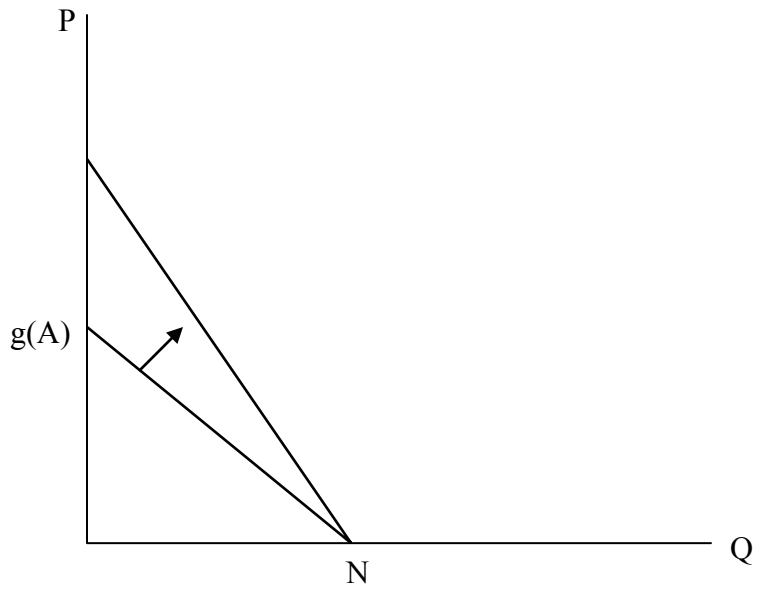


Figure 2

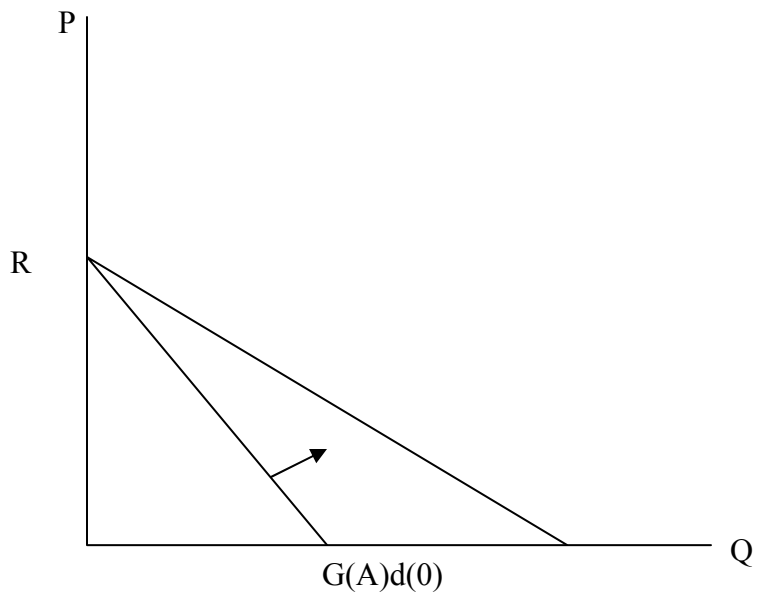


Figure 3

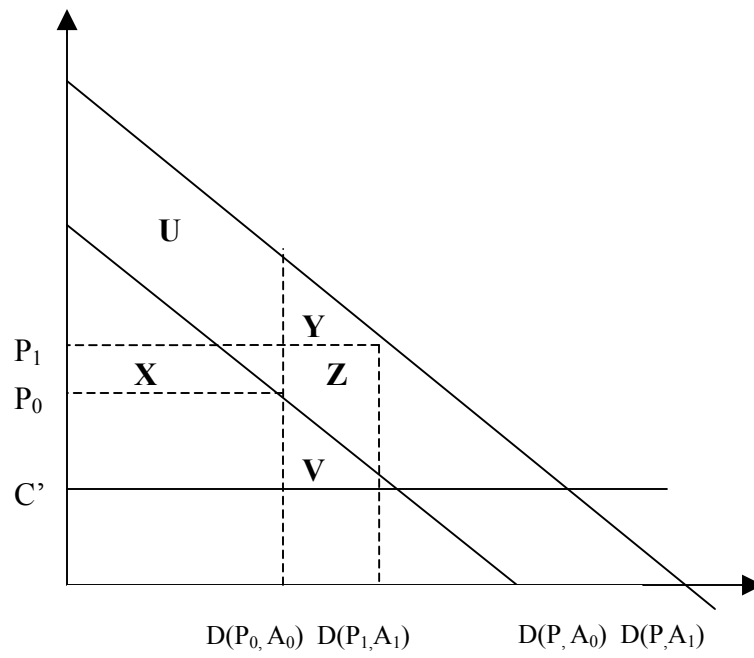


Figure 4

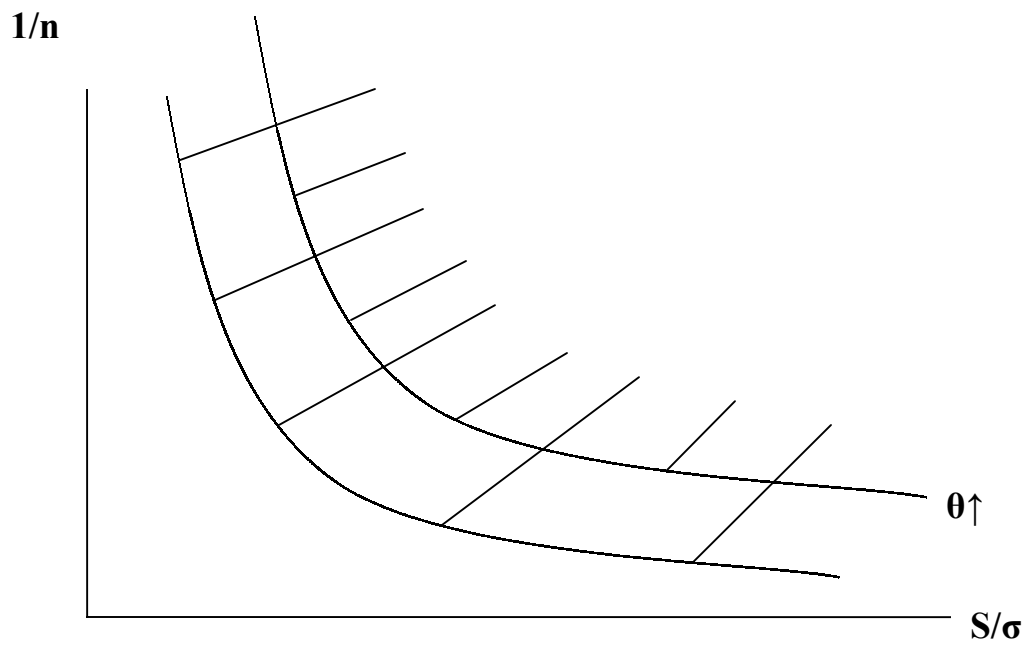


Figure 5a

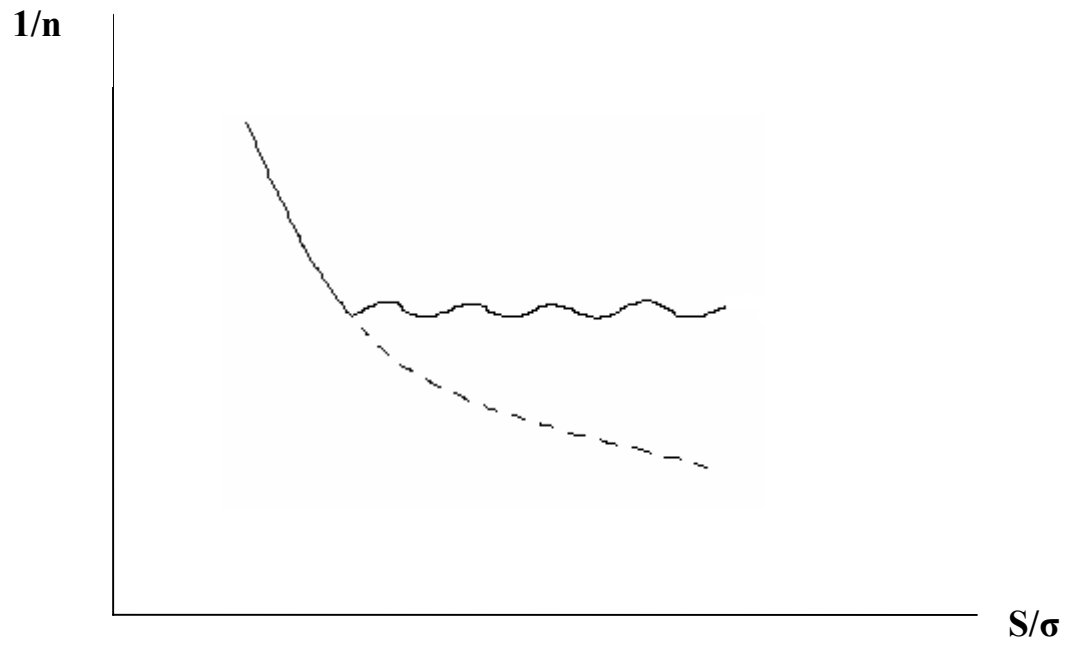


Figure 5b