ESSAYS ON INDUSTRIAL ORGANIZATION: EXCLUSIONARY CONTRACTS AND ADVERTISING CHOICE

by

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Abstract

This dissertation addresses some interesting questions related to exclusionary contracts and advertising choice. The first paper develops a model of long-term contracts as barriers to entry with differentiated products. It shows that if an incumbent firm can hold the consumer surplus in the pre-entry period hostage, he can sign the buyer up for a long-term exclusive contract regardless of the degree of product differentiation. Even though entry by an equally efficient firm is blocked, the contract still increases welfare if the incumbent's and the entrant's products are close substitutes. The model is further extended to include more periods, uncertainty, discounting, and no commitment power. When the incumbent is not able to credibly commit to refuse supply, entry may nevertheless still be blocked by the long-term contract. The objective of the second paper is to examine a monopoly firm's decision on price and advertising in a market where exclusivity matters. Two types of advertising are analyzed: (a) informative advertising, by which the firm provides information about the product's existence, features and quality, and (b) image advertising, by which the firm communicates an appealing image for the product with which buyers can associate themselves through their consumption of the good. In equilibrium only a fraction of consumers buy the image good. The effects of income dispersion, product nature, and existence of a strategic competitor on the equilibrium outcome and welfare are analyzed. It is found that monopoly advertises and serves more consumers than duopoly, generating higher total surplus. The third paper, which is joint with Tirtha Dhar, investigates the key macroeconomic drivers of deceptive advertising. We use a unique data set on advertising complaints in the United States, and combine it with macroeconomic indicators to show that deceptive advertising is counter-cyclical. When we analyze the data taking into account product durability, we find that this relationship is significant only in the case of nondurable goods. More importantly, deceptive advertising is pro-cyclical in the case of nondurable search goods, and counter-cyclical in the case of nondurable experience goods. These findings suggest policy recommendations related to the type of industry and prevailing economic conditions.

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For my parents, Gülden and Doğan,
and my sister, Sinem.

Co-Authorship Statement

The third paper of this dissertation is co-authored with Tirtha Dhar. Sebnem Ucar is the primary author in all regards. The identification of the research question for this paper were carried out jointly. Background research, the data analysis, and the preparation of the manuscript were performed by Sebnem Ucar, with comments on revisions provided by Tirtha Dhar.

Chapter 1

Introduction

The study of Industrial Organization adds frictions to the perfectly competitive models in economics, and analyzes firm interactions and market outcomes closer to those we encounter in the real world. The goal of this dissertation is to make contributions by addressing three interesting questions in the field of Industrial Organization Economics. First, I develop a model of long-term contracts as barriers to entry with differentiated products. Second, I present an advertising model of image goods. Third, I study empirically the role of macroeconomic factors and industry characteristics as drivers of deceptive advertising.

An exclusive dealing contract is typically offered by a manufacturer to a retailer requiring the latter to sell only the manufacturer's brand. These contracts can be considered as a form of vertical integration, and at times can be beneficial to both parties. Their effect as a barrier to entry was first explored formally in the seminal paper by Aghion and Bolton (1987). Many others have subsequently developed models under more general settings.

It is important to study exclusive contracts from the point of view of antitrust policy. In most jurisdiction, exclusive dealing and abuse of dominance cases are investigated by the competition authority under civil provisions. In Canada and the US, there have been a number of antitrust cases which involve long-term exclusive contracting. The three famous Canadian cases are *NutraSweet*, *Laidlaw*, and *Nielsen*. These companies first acquired a dominant position in the market. Then, they entered into long-term exclusive contracts with their customers. The contracts either obligated customers to purchase their entire supplies from the manufacturer, or were structured in such a way that they did not allow a new competitor to acquire a sufficient client base. Consequently, the parties were ordered not to enter into exclusive contracts which preclude or restrict potential competitors. Whether they are found anticompetitive or not, these contracts have significant effects on the structure of the industry in which they are employed.

In the first paper, I ask whether an incumbent, by means of an exclusive contract, can deter entry of an equally efficient rival producing a differentiated product. The answer is yes. The incumbent can do so by holding the consumer surplus earned by the buyer in the pre-entry period hostage. Perhaps more interestingly, the contract still increases welfare even though entry by an equally efficient firm is blockaded if the incumbent's and the entrant's products are close substitutes. The increase in the incumbent's profit with the contract outweighs the reduction in the consumer surplus and the entrant's forgone profit. If the buyer is a downstream monopoly firm, the exclusive contract always reduces the welfare. This is because the effect of the contract between the seller and the buyer is passed on to final consumers, who are made worse off with the contract. The results obtained continue to hold even if the incumbent cannot commit to not selling to the buyer if she rejects the contract offer, but under some parametric restrictions.

The model is extended to include more periods, uncertainty, and time discounting. It is shown that the incumbent optimally deters entry for a limited period, for it is too costly to keep the entrant out forever. Uncertainty and discounting open up the possibility for a higher contract price or a longer contract. Therefore, the incumbent firm is the party who benefits from uncertain entry and time discounting, whereas the consumer and the entrant suffer.

In the second paper, I justify why rational consumers react to image advertising. Everyday consumers are exposed to a wide variety of advertisements including those that are designed more to persuade than inform. The questions of interest here are: Why do rational consumers react to these efforts at persuasion, and what implications does this behavior have on the firm's advertising type and pricing decisions? As discussed in Veblen's (1899) classic work, consumption can be a social activity. Consumers' purchase decisions may depend not only on the product's ability to satisfy practical needs, but also on its ability to fulfill social needs such as providing prestige, uniqueness, or the need to communicate a certain image. Advertisements are, in fact, designed to appeal to these kinds of consumer needs.

To this end, I develop a model where consumers are both image-conscious and "snobbish." In other words, both image and exclusivity give them utility. The definition of snobbishness used here follows Leibenstein's (1950) terminology – a snobbish consumer's willingness-to-pay for a product goes down as the total number of consumers

increases. Even though snobbishness is more likely to be a significant factor in markets for luxury goods such as jewelry, perfumes, expensive watches, and luxury cars, research has shown that this kind of behavior can even exist for products like cookies (see Worchel, Lee and Adewole (1975)). This suggests that people might consume exclusive items not only for reasons of signaling their wealth or status, but also for the sake of being just different.

Given these preferences, there is room for persuasive or "image" advertising. To receive utility from consuming a product with snob effects, there is need for sufficient publicity about the product's image or exclusive attributes. Image advertising serves to create this publicity needed to increase consumers' willingness-to-pay. Next, the model is used to analyze a monopolist's optimal mix of different forms of advertising under various conditions, later allowing for duopoly competition

Snobbishness, in this model, comes from a consumption externality. A consumer's consumption has a direct negative effect on other consumers' utility. As a result, only a fraction of consumers buy the image good in equilibrium. The inherent nature of the product plays an important role in the firm's optimal mix of advertising. I report the following findings. Since the returns from informative advertising will be low if the product in question is of low intrinsic quality, the firm will devote a larger share of its advertising to image. The monopolist's profit is reduced by selling to more snobbish consumers if the product is of high quality. An increase in consumers' snobbishness causes the share of image advertising to decrease if the product is of low quality. Finally, in a differentiated duopoly setting, it is shown that the monopolist advertises more than the two duopolists combined, and more consumers are served under monopoly than under duopoly, leading to an increase in total welfare.

In the third paper, my coauthor, Tirtha Dhar, and I investigate the key macroeconomic drivers of deceptive advertising. Deception is a common practice in the marketplace. According to the U.S. Federal Trade Commission surveys, consumer fraud in America victimizes almost 25 million people each year (see Boush, Friestad, and Wright (2009)). This is still an underestimate of the actual amount of fraud since it only includes detected and reported deceptions that are illegal. The particular form of firm wrongdoing we focus on is deceptive advertising.

We use a unique data set on advertising complaints at the national level in the United

States, and combine it with macroeconomic indicators to show that false or deceptive advertising is counter-cyclical. In other words, firms' use of false advertising increases during periods of economic hardship. We theorize that when demand is expected to be low, firms will be under pressure to maintain today's profits even at the expense of future sales. Maintaining current profits can be achieved by deception. The cost of deception is potential loss of future sales. However, firms can still benefit from deception if the economy is moving into a recession since giving up already low future sales is justified by enhancing current profits.

We also investigate how different product characteristics play a role in the decision to use deception in advertising during good and bad economic times. For this, we turn to the literature on search and experience goods and product durability as discussed by Nelson (1970, 1974). When we analyze the data after taking into account product durability, we find that the counter-cyclical relationship is significant only in the case of nondurable goods. More importantly, we show that within nondurable goods deceptive advertising is pro-cyclical in the case of nondurable search goods, and counter-cyclical in the case of nondurable experience goods. We argue that the reason for the former finding is that consumers search more during bad times. The reason for the latter finding may be that sellers of experience goods can increase profits by deception when bad times are expected since the cost of deception during these times is low. These findings suggest policy recommendations related to the type of industry and prevailing economic conditions.

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Chapter 2

Long-Term Contracts as Barriers to Entry with Differentiated Products[1]

2.1 Introduction

The fact that an established firm might have a first-mover advantage against potential entrants is a common perception in economic theory. This paper studies the long-term exclusive contracts by a monopolist as a means to prevent entry of a potential entrant, who produces a horizontally differentiated product. The monopolist holds the consumer surplus in the pre-entry period hostage by threatening the buyer not to sell to her if the buyer rejects the contract offer. If the monopolist's threat is believed, exclusion occurs. This exclusion is in fact welfare improving if the products produced by the monopolist and the entrant are sufficiently close substitutes.

In Canada, there have been a few antitrust cases which involve long-term exclusive contracting. *NutraSweet*,[2] the supplier of artificial sweetener aspartame, controlled over 95% of the aspartame market in Canada. NutraSweet had few but large customers like Coke and Pepsi. By using its dominant market position in Canada, it attained contractual terms that obligated its customers to purchase their entire supplies of aspartame from NutraSweet. Fidelity rebates were in force in order for customers to be able to obtain a price competitive with the price offered to other customers. Furthermore, discounts and price allowances were granted to customers for use of the NutraSweet logo and name. These practices foreclosed major portions of the Canadian market of aspartame to competition, and therefore were found to be preventing or substantially lessening competition.

[1] A version of this chapter will be submitted for publication. Ucar, Sebnem. Long-Term Contracts as Barriers to Entry with Differentiated Products.

[2] *Canada (Director of Investigation and Research) v. NutraSweet Co.* (1990), 32 C.P.R. (3d) 1 (Comp. Trib.)

A second case is a waste case. *Laidlaw*[3] was engaged in commercial waste services, collection and disposal. These services included residential, commercial and industrial customers in Canada and North America. Even though Laidlaw was a latecomer to the Vancouver Island market in British Columbia, it was able to expand quickly by acquiring its competitors. In the end, Laidlaw had a market share of 87%-100% on Vancouver Island. After attaining its dominant position, Laidlaw entered into long-term exclusive agreements with automatic renewal and excessive liquidated damages. With the natural entry barrier being the need to acquire a sufficient client base, these contracts erected artificial barriers for new entrants because they effectively precluded the customer from seeking the services of a competitor. Laidlaw was prohibited from entering into exclusive contracts by the Canadian Competition Tribunal.

It is also possible to observe exclusive contracts imposed by downstream firms. *Nielsen*[4] is such an example. Nielsen's job, as a supplier of scanner-based market tracking services, was to purchase the data, process it and resell it to grocery manufacturers, market research agents, etc. After negotiating independent and sequential long-term exclusive contracts with all major grocery retail chains for scanner-based data in Canada, Nielsen managed to be the sole supplier of these services. The contracts offered were structured in such a way that their renewals occurred at different times so as to limit the available sources of data. Since the data needed for analysiswas required from the outset, these contracts raised barriers where they did not formerly exist, thus precluding any potential competitors from entry. Nielsen was ordered not to enter into contracts that precluded or restricted a supplier of scanner data from providing a potential supplier of scanner-based market tracking services with access to its scanner data.

There are some exclusive contracting cases in the U.S. Two such cases are *Tampa Electric*[5] and *Jefferson Parish*.[6] Tampa Electric, a Florida public utility, contracted with a group of coal mines to supply all of the coal it would need for a twenty-year period. The competitive effect of the exclusive contract's foreclosure of other coal suppliers by excluding them from a substantial volume of trade was at issue. The Supreme Court

[3] *Canada (Director of Investigation and Research) v. Laidlaw Waste Systems* (1992), 40 C.P.R. (3d) 289 (Comp. Trib.)

[4] *Canada (Director of Investigation and Research) v. D & B Companies of Canada Ltd.* (1996), 64 C.P.R. (3d) 216 (Comp. Trib.)

[5] *Tampa Electric Co. v. Nashville Coal Co. et al.*, 365 U.S. 320 (1960)

[6] *Jefferson Parish Hospital District No. 2 v. Hyde*, 466 U.S. 2 (1984)

noted that the volume of coal covered by the contract was less than 1% share of the relevant market. Thus, the contract was not found to violate the Clayton Act.[7]

In the Jefferson Parish case, the hospital governed by petitioners contracted with a firm of anesthesiologists, Roux & Associates, requiring all anesthesiological services for the hospital's patients to be performed by that firm. Because of this contract, Dr. Hyde's application for admission to the hospital's medical staff as an anesthesiologist was denied. The effect of the exclusive contract was that any consumer of medical services who elects to have an operation performed at East Jefferson Hospital may not employ any anesthesiologist not associated with Roux. The District Court found that the anticompetitive consequences of the contract were minimal and outweighed by benefits in the form of improved patient care. The Court of Appeals reversed the decision, finding the contract illegal "per se." However in the end, since the exclusive dealing arrangement foreclosed only a small fraction of the markets in which anesthesiologists may sell their services, the exclusive contract in question was not found to violate the Sherman Act[8] by the Supreme Court.

Whether they are found anticompetitive or not, long-term contracts have significant effects on the structure of the industry. The current paper presents a model of such contracts in which the incumbent firm has the pre-entry period to make a contract offer, and consequently influence the entry decision of a competitor. In this pre-entry period, the incumbent threatens the buyer not to sell to her if the contract offer is rejected. In effect, the consumer surplus in this period is held hostage. First, it is assumed that the incumbent's threat is credible. There might be situations where it is actually optimal for the incumbent to keep the promise of not selling to the buyer. For instance, even though not modeled here, the incumbent might be producing in more than one market and breaking his promise might hurt his reputation and, therefore, his profits in other markets significantly. Second, the no commitment case is analyzed. It should be noted that without commitment, the incumbent has to compensate the consumer for the surplus that she

[7]The Clayton Act regulates general practices that potentially may be detrimental to fair competition. Some of these general practices regulated by the Clayton Act are: price discrimination; exclusive dealing contracts, tying agreements, or requirement contracts; mergers and acquisitions; and interlocking directorates.

[8]The Sherman Antitrust Act is a Federal law prohibiting any contract, trust, or conspiracy in restraint of interstate or foreign trade. The Sherman Act also provides that no person shall monopolize, attempt to monopolize or conspire with another to monopolize interstate or foreign trade or commerce.

would have attained both pre- and post-entry had there been no contract. In this case, the hostage story does not apply any more.

The rest of the paper is organized as follows. In Section 2.2, the literature on exclusive contracts is discussed. Section 2.3 presents the model when the buyer is the final consumer, and states the equilibrium and the welfare result. The model is modified in Section 2.4 to take account of the case where the buyer is the monopoly retailer. In Section 2.5, various extensions are discussed. For the purpose of exposition the no commitment case is postponed until the last subsection of the extensions. Finally, Section 2.6 presents the conclusion. The proofs of the propositions appear in Appendix A.1.

2.2 Literature

The Chicago School View (CSV) argues that exclusive contracts must be efficient; otherwise they would not be signed by the buyers. In other words, unless compensated for the cost of their loss in economic freedom, the buyers will not accept constraints in contracts.[9] Since the buyers are not made worse off and the seller is better off, the CSV claims that there must be an efficiency benefit to exclusivity of this type. However, the welfare effects differ under different specifications.

It is after Aghion and Bolton (1987) (henceforth AB) that the exclusive contracts between buyers and sellers started to be explored widely in entry prevention models. AB demonstrate cases under which the CSV does not hold. In their model, the incumbent firm offers the buyer an exclusive contract with liquidated damages. These damages are to be paid by the buyer if she signs the contract but does not trade with the incumbent and instead buys from the entrant. In effect, the damages act as an entry fee for the entrant. This transfer from the entrant is shared by the contracting parties. The contract does not always prevent entry, but when it does it is inefficient.

Rasmusen, Ramseyer and Wiley (1991) (henceforth RRW) show that a monopolist can exploit customer disorganization and exclude potential rivals by signing exclusive contracts with buyers. The monopolist tries to convince enough buyers to sign the contract in order to prevent the entrant from reaching the minimum viable scale. The authors consider both simultaneous and sequential contract offers. Their result is a version of a

[9] See Richard A. Posner (1976) and Robert H. Bork (1978).

coordination game for the simultaneous model. There are two sets of equilibria: either all buyers sign the contract and entry is deterred, or none signs the contract and entry occurs. When the buyers are disorganized, they are likely to end up with the "bad" equilibrium in which all buyers sign the contract and the outcome is inefficient. For the sequential model, the equilibrium is unique: either all buyers sign or none signs, depending on the parameters. This uniqueness of equilibrium comes from the fact that the sequential game is a game of perfect information.

Innes and Sexton (1994) (henceforth IS) support the CSV by adding a new dimension to the existing models: strategic buyers who can contract with the entrant. Allowing for buyer-entrant contracting internalizes the gains of these two parties from avoiding monopoly prices. Unlike AB and RRW, IS show that an exclusive contract, which deters only inefficient entry, can still cause welfare to increase even though it reduces competition.

More recently, Fumagalli and Motta (2006) claim that exclusive contracts typically do not involve final consumers, but rather firms. They use the framework of RRW with the modifications that exclusive contracts happen between upstream and downstream firms and there is downstream competition. Downstream firms use the input from the upstream firms, and after transforming it into a final product they sell it in the final market. They show that intense downstream competition makes the input demand of a single buyer large enough to cover the entrant's fixed cost and trigger entry. This is because that buyer is able to buy a cheaper input from the entrant, sell his final product at a lower price than his rivals and capture the entire downstream market. The compensation offered by the incumbent has to be so high that it becomes too costly to block unilateral deviations. In other words, each buyer is pivotal for exclusion.

The current model differs from these papers, in that the incumbent firm has one period of monopoly power before the entrant appears. Exploiting the first-mover advantage, the incumbent tries to keep the entrant out in the following periods. With linear demands and uniform pricing, even if there is monopoly pricing in the first period, consumers still enjoy some consumer surplus. The incumbent can indeed hold this surplus generated in the first period hostage against the buyer. The threat of losing this surplus in the first period may be enough to induce the buyer into the long-term exclusive contract. In a way, the incumbent is tying the good he produces in the first period to the same good in

the later periods. In this respect, the current model is closely related to the literature on tying. Whinston (1990) considers two markets, one of which is monopolized by a firm and the other is served by two firms producing differentiated products. He shows that tying can serve as a barrier to entry in the second market. Thus, the firm with monopoly power in the first market can "leverage[10]" his market power and extract more profits in the second market. Mathewson and Winter (1997) consider a model in which the monopolist tries to tie purchases of the monopolized good to purchases of a competitively supplied good under demand uncertainty. They show that tying can be profitable, and even Pareto improving with two-part pricing. The model discussed in this paper is linked to these two models while the two periods can be considered as two different markets.

Another new feature incorporated into the model, absent from the AB, RRW and IS models, is product differentiation. The above-cited papers consider homogeneous products only; the entrant, if he enters the market, produces the same product as the incumbent. He only differs from the incumbent in terms of his cost structure. This implies that only the lowest cost firm will serve the market in a Bertrand competition. In this paper, I consider a differentiated products environment so that there are potential profits for both firms. It is assumed that the entrant produces just as efficiently as the incumbent. This assumption allows one to focus on the welfare effects independently from the fact that one firm is producing more efficiently than the other. It is interesting to see that the degree of differentiation plays an important role in the optimal contract and the welfare effects. I consider two different settings: the buyer as the final consumer and as the downstream monopolist. The incumbent offers a simple enforceable uniform price take-it-or-leave-it contract, in which he refuses to sell to the buyer in the first period if the buyer does not sign, with the assumption that the incumbent has commitment power. Then in the extensions, I look at the case of no commitment power, along with the three-period version of the model and uncertainty. I find the optimal contract and study its welfare effects under these different settings.

[10] See Whinston (1990) for a short description of the "leverage theory."

2.3 Buyer as the Final Consumer

Although it may not be typical, buyers can be the final consumers in exclusive dealing clauses.[11] This is a two-period model consisting of three agents: an incumbent firm, a representative consumer and an entrant firm. In period 1, there is an incumbent producing one product and selling it to a consumer. In period 2, the entrant appears in the market with a differentiated product. Its entry decision depends on the action taken by the incumbent in the previous period. The incumbent can offer a take-it-or-leave-it contract to the consumer in period 1. The contract requires the consumer to buy exclusively from the incumbent. If the incumbent offers the contract, then the consumer can either sign or reject it. In case of rejection, the incumbent does not sell to her at all in this period. After observing what has happened between the incumbent and the consumer in period 1, the entrant makes the entry decision. If it enters and there is no contract in place, the two firms engage in a Bertrand price competition.

The crucial assumption here is the fact that the incumbent can credibly threaten the buyer not to sell to her in case of contract rejection. One might think that refusing to sell to the buyer when the contract is rejected is not a credible threat by the incumbent. This is true since it is in the incumbent's best interest to still sell his product at the monopoly price in period 1, if we think of this market as isolated from others. However, the incumbent might be operating in more than one market, and it might be in his best interest not to supply anything in one of the markets when he promises so. In other words, there might be unmodeled reputation mechanisms at work so that the incumbent's threat is believed. For this reason, I carry on the analysis under this assumption for most of the paper. However, I relax this assumption in the extensions to allow for no commitment power by the incumbent.

2.3.1 Benchmark Model

To express the consumer's utility, I use the type of utility function that Singh and Vives (1984) use. To be able to ignore income effects, I make two common assumptions. The first one is that there is a competitive numeraire good entering linearly in the utility func-

[11] One example is cell phone and home phone services, where customers sign 2 or 3-year contracts with phone service providers.

tion with its price normalized to one. The second assumption says that the consumer has enough wealth to buy her optimum amounts of the products. From now on, this numeraire good will be omitted from the analysis.

The consumer's utility function is $U_1(x_1^I)$ in period 1, and $U_2(x_2^I, x_2^E)$ in period 2, both of which are quadratic and strictly concave. The discount factor is 1.

$$U_1(x_1^I) = ax_1^I - \frac{b}{2}(x_1^I)^2 \tag{2.1}$$

$$U_2(x_2^I, x_2^E) = ax_2^I + ax_2^E - \frac{b}{2}(x_2^I)^2 - \frac{b}{2}(x_2^E)^2 - dx_2^I x_2^E \tag{2.2}$$

where x_t^i is the amount of product i consumed, $i = I, E$ (I and E stand for the incumbent and the entrant, respectively), $t = 1, 2$. $d \in [-b, b]$ is a parameter indicating the strength of product differentiation. It can also be interpreted as a measure of how much the consumer values consuming the two products together. The two products are substitutes if $d > 0$, independent if $d = 0$, and complements if $d < 0$. When $d < 0$,[12] the firms would want to price their products together and each one would want the other to sell as much as possible. Exclusion would never be an optimal strategy. Therefore, I rule out these values and assume $d \in [0, b]$. All parameters are positive.

Since there are no income effects on x^I and x^E, we can interpret the utility function as representing the willingness-to-pay and write the consumer surplus as the difference between utility and expenditure. In period 1, since product E is not available, the consumer surplus is

$$CS_1(x_1^I) = U_1(x_1^I) - p_1^I x_1^I. \tag{2.3}$$

The consumer surplus in period 2 is the following if there is no contract in place:

$$CS_2(x_2^I, x_2^E) = U_2(x_2^I, x_2^E) - \sum_{i=I,E} p_2^i x_2^i \tag{2.4}$$

where p_t^i is the price of product i charged by firm i, $i = I, E$, $t = 1, 2$. By maximizing the consumer surplus in (2.3) and (2.4), one can get the direct demands in each period as

[12] When $d = -b$ the demand system may not be well defined.

given by the following.

$$
\begin{aligned}
x_1^I &= \frac{a}{b} - \frac{1}{b} p_1^I \\
x_2^I &= \alpha - \beta p_2^I + \gamma p_2^E \\
x_2^E &= \alpha - \beta p_2^E + \gamma p_2^I
\end{aligned}
$$

where $\alpha = \frac{a}{b+d}$, $\beta = \frac{b}{b^2-d^2}$, and $\gamma = \frac{d}{b^2-d^2}$.

First, I consider the case where a contract between parties is not allowed. Starting with period 2, the game is solved using backward induction. When there is no contract in place, the entrant will enter in period 2. The two firms will compete in a Bertrand sense. They both have a constant marginal cost of c, normalized to zero with no loss of generality. Choosing p^i, each firm maximizes their profit in period 2 given by

$$
\pi_2^i = (\alpha - \beta p_2^i + \gamma p_2^j) p_2^i \quad \text{for} \quad i = I, E. \tag{2.5}
$$

Equilibrium prices and quantities in period 2 are given by the following (*NC* stands for "no contract")

$$
\begin{aligned}
p_2^{I,NC} &= p_2^{E,NC} = \frac{a(b-d)}{2b-d} \\
x_2^{I,NC} &= x_2^{E,NC} = \frac{ab}{(b+d)(2b-d)}
\end{aligned} \tag{2.6}
$$

where $p_2^{i,NC}$ is the price charged by firm i, and $x_2^{i,NC}$ is the amount of product i exchanged between the buyer and firm i in period 2 when there is no contract in place. Inserting these values in (2.4), the corresponding consumer surplus is

$$
CS_2^{NC} = \frac{a^2 b^2}{(b+d)(2b-d)^2} \tag{2.7}
$$

There are two effects of d on the consumer surplus shown in (2.7). The "direct effect" comes from the fact that the utility function has the parameter d. When d is higher, the consumer's utility is lower because consuming similar goods together gives her a disutility of $d x_2^I x_2^E$. Lower utility, in turn, means lower consumer surplus. However,

there is a second effect, which I call the "competition effect:" when d is higher, the competition between the incumbent and the entrant in period 2 becomes more intense, leading to lower prices, and in turn, a higher consumer surplus in period 2. Altogether the competition effect dominates since $CS_2^{NC}(x_2^I, x_2^E)$ is increasing in d; the buyer gets higher consumer surplus if the goods are closer substitutes.

In period 1 the incumbent is the only operating firm in the market. Therefore, he charges the monopoly price. The equilibrium price, quantity and the corresponding consumer surplus in period 1 are given by

$$p_1^{I,NC} = \frac{a}{2},\ x_1^{I,NC} = \frac{a}{2b}$$
$$CS_1^{NC} = \frac{a^2}{8b}.$$

2.3.2 Exclusive Contract

I consider a specific type of contract: take-it-or-leave-it contract with uniform pricing. The incumbent firm's contract offer is such that it will charge the consumer a fixed price both periods,[13] provided that she buys exclusively from the incumbent both periods. The contract has to promise the consumer at least her second period surplus, or she will not sign it, making the demand for good I zero in period 1. Thus, the incumbent's problem is

$$\max_{\overline{p}} \quad \pi^{I,WC}(\overline{p}) \quad \text{subject to} \quad CS^{WC}(\overline{p}) \geq CS_2^{NC}$$
$$\text{and} \quad \pi^{I,WC}(\overline{p}) \geq \pi_1^{I,NC} + \pi_2^{I,NC} \tag{2.8}$$

where $\overline{p}$ is the contract price. The left hand side of the first constraint is the consumer surplus under the contract $\overline{p}$ and the right hand side of the same constraint is the consumer surplus in period 2 if the consumer rejects the contract offer. The second constraint makes sure that the contract provides at least as much profit as the no contract case. The right hand side of the second constraint is the profit without the contract offer. The following propositions state the equilibrium outcome.

Proposition 2.3.1. *The solution to the incumbent's constrained maximization problem in*

[13] Charging a fixed price both periods is optimal because in each period the incumbent maximizes the same concave monopoly profits.

(2.8) *is*

$$\overline{p}^* = a - \frac{ab^{3/2}}{(b+d)^{1/2}(2b-d)} > 0.$$

Proposition 2.3.2. $\pi^{I,WC}(d) \geq \pi_1^{I,NC}(d) + \pi_2^{I,NC}(d)$ *for* $\forall d \in [0,b]$. *Thus, the incumbent always offers the contract and exclusion occurs.*

The incumbent always finds it profitable to offer the contract. In other words, no matter how differentiated the entrant's product is, the incumbent always offers the contract to the consumer and ties her up to buy exclusively from him for two periods. The consumer enjoys only good I. Entry never occurs in the second period since the entrant knows that his profit would be zero if he enters. The incumbent sets the contract price, $\overline{p}$, such that the consumer gets just enough consumer surplus under the contract and still accepts the offer. The change in the contract price in relation to the differentiation parameter is seen in Figure 2.1. The parameter values used are $a = 1$, $b = 1$.

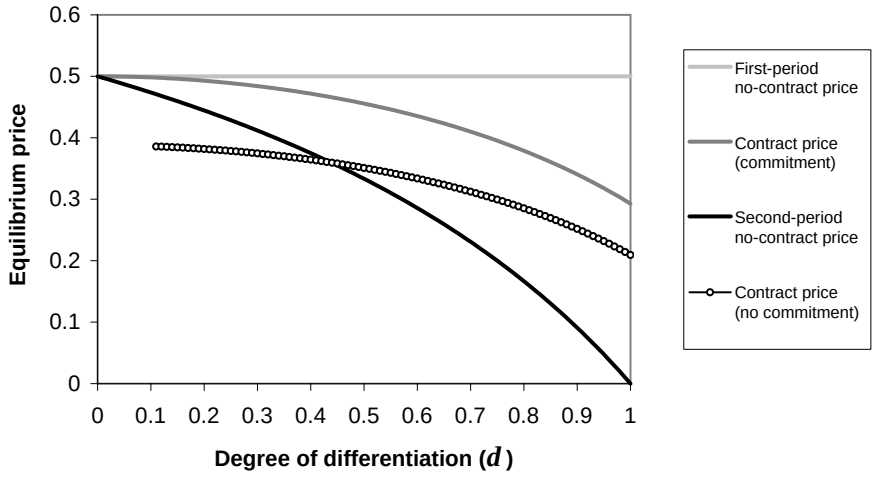

Figure 2.1: Responsiveness of prices to differentiation.

Corollary 2.3.3. *The contract offer is more favorable for the buyer if the goods are closer substitutes.*

It can easily be shown that the contract price is decreasing in the value of d. When d is higher, then the goods are closer substitutes, and the incumbent has to offer a more

favorable contract; in other words, he has to offer a contract with a lower price (see Figure 2.1). This is because when the goods are closer substitutes, competition becomes more intense. The consumer knows that she can always reject the contract and give up consumption of the incumbent's product in period 1. Recognizing that the entrant will show up supplying a very similar product next period, she might as well consume both products in the second period, when the prices are low. Unless she is faced with a sufficiently low contract price, she will not accept the contract.

Next, I look at the welfare effects of the exclusive contract.[14] I compare the total surplus with and without the exclusive contract. The total surplus, denoted by TS, when there is no contract offer is the summation of the incumbent's two-period profit, two-period consumer surplus and the entrant's one-period profit. The total surplus with the contract $\overline{p}^*$ is the summation of the two-period profit of the incumbent and two-period consumer surplus, since the entrant won't be making any profits with the exclusive contract. The following proposition states under what condition the contract is welfare improving.

Proposition 2.3.4. *There is a* $\hat{d} \in [0,b]$ *such that* $TS^{WC}(d) \leq TS^{NC}(d)$ *for* $d \in [0,\hat{d}]$ *and* $TS^{WC}(d) \geq TS^{NC}(d)$ *for* $d \in [\hat{d},b]$.

Lemma 2.3.5. $\hat{d} \approx 0.93b$.[15]

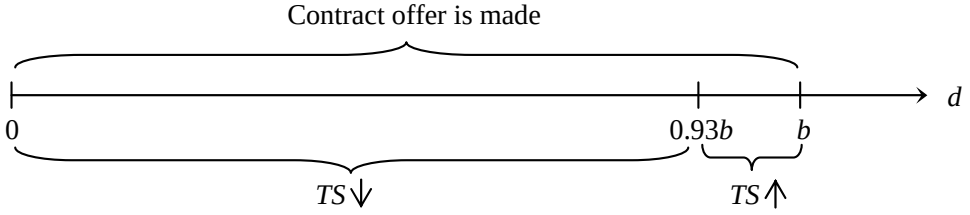

Figure 2.2: Contract offer and welfare.

There is a critical value for d, denoted by $\hat{d}$, which makes the total surplus with and without the contract equal. For values of d under this critical level of product differen-

[14] Exclusive contracts can lessen or prevent competition. However, they are not bad for welfare *per se*. For instance, in the *Jefferson Parish* case, the District Court found that the anticompetitive consequences of the contract were minimal and outweighed by benefits in the form of improved patient care. The argument was that there was a quality improvement for the service the hospital was providing.

[15] This value is computed using *Maple*.

tiation, the total surplus will be reduced by the exclusive contract. In other words, the exclusive contract reduces welfare (see Figure 2.2). For values of d below this critical level, the contract increases welfare.

As the products become closer substitutes, the no-contract total surplus (TS^{NC}) goes down. This is because of the strategic interaction between the incumbent and the entrant. The firms reduce their prices in response to more intense competition, and this leads to lower profits. Even though the consumer enjoys a larger consumer surplus, this increase is not sufficiently large to compensate for the loss in both firms' profits. On the other hand, as the products become closer substitutes, the total surplus with the contract (TS^{WC}) goes up. The incumbent firm has to lower the contract price since the entrant is a more rigorous competitor when products are very close substitutes. This will lead to a lower profit. However, the rate of the profit decrease is slower with the contract because the incumbent retains a bigger market in period 2 with the contract compared to the no-contract case. The consumer surplus is larger with the lower contract price. This increase is sufficiently large to compensate for the loss in the profit. Thus, we have TS^{NC} decreasing and TS^{WC} increasing with less differentiation. The latter eventually exceeds the former when d is sufficiently large, i.e. when the products are sufficiently similar.

A more intuitive way to understand Proposition 2.3.4 is the following. The incumbent and the buyer are effectively taxing the entrant with the exclusive contract. If the products are sufficiently similar, profits in the second period are small, and so is the tax that the incumbent can extract from the entrant. On the consumer side, the giving up of the entrant's product does not cause a large loss because the buyer does not value consuming similar products as much as consuming dissimilar products. Overall effect is that the total surplus increases. One should also note the fact that the contract sets a middle price in both periods instead of a high price in period 1 and a low price in period 2. This is more prominent for lower levels of differentiation (i.e. for higher d). From Figure 2.1, one can see that the contract price is closer to the average of the first-period and second-period contract prices for higher d. This contributes to the efficiency by decreasing the deadweight loss since the total surplus function is concave.

2.4 Buyer as the Monopoly Retailer

This section is intended to see the consequences of adding another link in the vertical chain between the firm and the consumer. It is not rare to see local monopolies operating in small geographic regions, like a gas station on an expressway rest stop or water and electricity delivery companies. This case is one of the two extreme cases for the downstream market structure. Another extreme is that the downstream market has perfectly competitive retailers. Then the price of the two products will be driven down to their wholesale price. This leads to zero downstream profits, in which case the hostage story no longer applies. An intermediate case would be an imperfectly competitive downstream market, in which case the hostage story might work but there might also be a coordination problem among retailers.[16] I do not analyze downstream competition in this paper.

The findings regarding the contract offer and the profitability of the contract do not change. When the final consumer is just replaced by a monopoly retailer, the manufacturers now maximize their profits given the derived demand for their products. The monopoly retailer takes the role of the final consumer in Section 2.3. However, in the downstream market, the final consumers will be affected adversely because of double marginalization under the contract. Thus, the welfare result changes.

The following is a two-period model with an additional agent: a monopoly retailer. In this economy, the incumbent manufacturer sells a product to the monopoly retailer and the retailer resells it to the final consumer. The entrant manufacturer appears to enter the market with a differentiated product in the second period. By taking an action in the first period, the incumbent's aim is to keep the entrant out and be the only upstream supplier. Particularly, he decides whether to offer the retailer a take-it-or-leave-it contract, which requires the retailer to buy exclusively from the incumbent for two periods. If the contract offer is made but rejected, then the incumbent refuses to sell to the retailer in the first period. This leads to no sales upstream or downstream in the first period. By the help of the contract, the incumbent seeks to hold the first period surplus of the monopoly retailer hostage. Finally, if there is no contract offer or if the contract offer is rejected in the first period, then the entrant enters in the second period and the two manufacturers engage in a Bertrand price competition. Then the retailer sells both product I and product

[16] For exclusive contracts with downstream competition, see Fumagalli and Motta (2006).

E.

In the downstream market, the retailer maximizes his profit by choosing the retailer price, r^I in the first period, and r^I and r^E in the second period. His profits for period 1 and 2 are, respectively, as follows.

$$\pi_1^R = (\frac{a}{b} - \frac{1}{b}r_1^I)(r_1^I - w_1^I) \tag{2.9}$$

$$\pi_2^R = (\alpha - \beta r_2^I + \gamma r_2^E)(r_2^I - w_2^I) + (\alpha - \beta r_2^E + \gamma r_2^I)(r_2^E - w_2^E) \tag{2.10}$$

where w_t^i is the wholesale price charged by manufacturer i, $i = I, E$, $t = 1, 2$, and $\alpha = \frac{a}{b+d}$, $\beta = \frac{b}{b^2-d^2}$, and $\gamma = \frac{d}{b^2-d^2}$. The constant marginal cost is normalized to zero, without loss of generality, so that the retailer has no additional cost.

The manufacturer firms are equally efficient and they have a constant marginal cost of c normalized to zero. Choosing w_t^i, they maximize their profits given the derived demand for their products. The upstream profits for period 1 and 2 are, respectively,

$$\pi_1^I = (\frac{a}{b} - \frac{1}{b}r_1^I)w_1^I \tag{2.11}$$

$$\pi_2^i = (\alpha - \beta r_2^i + \gamma r^j)w_2^i \text{ for } i = I, E. \tag{2.12}$$

Using the retailer's best response, the manufacturers' problem in period 2 transforms into

$$\max_{w_2^i} \quad \pi_2^i = (\alpha - \beta\frac{a + w_2^i}{2} + \gamma\frac{a + w_2^j}{2})w_2^i, \quad i = I, E. \tag{2.13}$$

Solving for w_2^i and r_2^i, I get

$$w_2^{i,NC} = \frac{a(b-d)}{2b-d}, \quad r_2^{i,NC} = \frac{a(3b-2d)}{2(2b-d)}, \quad i = I, E.$$

With the same logic of Section 2.3, the manufacturer tries to lock in the monopoly retailer so that he will be the only upstream supplier in period 2. He offers a fixed price contract to the retailer. If the retailer does not sign the contract, the incumbent refuses to

sell to him in period 1. The incumbent's problem is, therefore,

$$\begin{aligned} \max_{\overline{w}} \quad \pi^{I,WC}(\overline{w}) \quad \text{subject to} \quad & \pi^{R,WC}(\overline{w}) \geq \pi_2^{R,NC} \\ \text{and} \quad & r^I \in \arg\max_{\tilde{r}^I} \pi^{R,WC}(\overline{w}) \\ \text{and} \quad & \pi^{I,WC}(\overline{w}) \geq \pi_1^{I,NC} + \pi_2^{I,NC} \end{aligned} \tag{2.14}$$

The first constraint makes sure that the retailer accepts the contract offer with price $\overline{w}$; the second constraint is the profit maximizing condition for the retailer; and the third constraint guarantees that the incumbent makes at least as much profit with the contracts as without the contract. The overall problem is very similar to the one given by (2.8). The solution to the incumbent manufacturer's constrained maximization problem in (2.14) is

$$\overline{w}^* = a - \frac{ab^{3/2}}{(b+d)^{1/2}(2b-d)}$$

which is the same contract price given in Proposition 2.3.1. In addition, $\pi^{I,WC}(d) \geq \pi_1^{I,NC}(d) + \pi_2^{I,NC}(d), \forall d \in [0,b]$; meaning, the incumbent manufacturer always offers the contract and exclusion occurs. I do not state these findings due to their resemblance to the previous ones. The following proposition states the welfare result.

Proposition 2.4.1. $TS^{WC}(d) \leq TS_1^{NC}(d) + TS_2^{NC}(d), \forall d \in [0,b]$. *Thus, the contract offer made by the incumbent is always welfare-reducing.*

Although the results about the contract offer and the profitability of the contract are consistent with the results in Section 2.3, the welfare result is very different. This is because of the extra step added to the vertical chain between the manufacturer and the final consumer. When the buyer is the final consumer, the increase in the incumbent firm's profit is large enough to compensate for the reduction in the consumer surplus and giving up of the entrant's profits for low levels of differentiation. However, when the buyer is a monopoly retailer, not only the subject of the contract (i.e. the retailer) and the entrant are worse off, but also the final consumer due to double marginalization. The retailer accepts the offer not to give up profits in period 1. In effect, the wholesale price in period 2 is increased with the contract. The retailer's response is to increase the retail price. Consequently, the final consumer pays a higher price, and is worse off, than in the

no-contract case. The increase in the incumbent's profits with the contract is not large enough to compensate for the reduction in the surplus of the other three parties.

2.5 Extensions

There are four natural extensions to the original model where the buyer is the consumer. First, I extend the model to include three periods and see whether the incumbent firm will offer a longer-term contract trying to keep the entrant out for two periods or longer. Second, I analyze the case where the entrant shows up in period 2 with a probability less than 1 to see whether this gives the incumbent more power. Third, I look at the effect of time discounting on the choice of contract offer. Finally, I consider the case of no commitment power by the incumbent to see if the results established in Section 2.3 and 2.4 still hold.

2.5.1 Three-Period Model

In the two-period model, it is shown that the incumbent always finds it profitable to offer a take-it-or-leave it contract than not offering a contract when it is known that there will be entry of a differentiated duopolist in the second period. If there were more periods, could the incumbent offer a longer-term contract and keep the entrant out forever? Is there only a certain number of periods for which the incumbent will choose to deter entry? These questions are answered here by looking at the three-period version of the model in which the buyers are final consumers.

When there are more periods of interaction between the two firms, it is going to be harder for the incumbent to convince the consumer to sign the contract because he has to compensate her for a higher consumer surplus. The three-period no-contract consumer surplus is

$$CS_1^{NC} + CS_2^{NC} + CS_3^{NC} = \frac{a^2}{8b} + 2\frac{a^2b^2}{(b+d)(2b-d)^2}. \tag{2.15}$$

The following results are established.

Proposition 2.5.1. *A three-period contract is never offered by the incumbent to the consumer.*

Corollary 2.5.2. *The incumbent always offers a two-period contract and entry occurs in the third period.*

These two results are important because they state that if the incumbent can enjoy monopoly profits of only one period and there is more than one period of interaction between the incumbent and the entrant in the absence of a contract, then the incumbent chooses to offer only a two-period contract and let the entrant enter starting from period 3. The hostage, in other words, the one-period consumer surplus, is not sufficiently large to allow the incumbent to deter entry for more than one period. Therefore, the incumbent's optimal choice is to offer a two-period contract no matter how long he is going to interact with the entrant.

How is it possible to get longer-term contracts? In the above scenario, the incumbent firm and the buyer interact for one period before the entrant appears in the market. However, when the entrant comes in later periods, it is easier for the incumbent to get the consumer to sign longer-term contracts since the hostage – the pre-entry consumer surplus – will be larger. Also, up to this point I have considered full information and no time discounting. If the future returns were discounted both by the firms and the consumer, it is not obvious whether it is profitable for the incumbent to offer the contract. In the following two subsections, uncertainty and time discounting are incorporated into the basic model.

2.5.2 Uncertainty about Entrant Appearing in Period 2

In this section, it is assumed that the entrant will show up in the second period with an exogenous probability, $\rho \in (0,1)$, known to the incumbent and the consumer. A possible interpretation of this exogenous probability is that, a new firm will discover this market with probability ρ in period 2, and enter only if it makes positive profits.

The *ex ante* two-period no-contract consumer surplus is given by

$$CS_1^{NC} + CS_2^{NC} = \frac{a^2}{8b} + \rho \frac{a^2 b^2}{(b+d)(2b-d)^2} + (1-\rho)\frac{a^2}{8b}. \tag{2.16}$$

The reason why one can write the expected consumer surplus in this way is as follows: Even though the utility function is strictly concave in quantities, expenditure on the goods enters the consumer surplus function in a linear fashion. Since the consumer surplus function is quasi-linear in expenditure, the expected consumer surplus in period 2 becomes the weighted average of the consumer surpluses in the case of entry and no entry, and is represented by (2.16). The following proposition states the optimal contract. Figure 2.3 shows it graphically.

Proposition 2.5.3. *The optimal contract under uncertainty is*

$$\overline{p}^* = \begin{cases} a/2 & \text{if } \rho \in [0, \rho^*] \\ a - a[\frac{\rho b^3}{(b+d)(2b-d)^2} + \frac{1-\rho}{8}]^{1/2} & \text{otherwise} \end{cases}$$

where $\rho^* = 1 - \frac{2d^2(3b-d)}{3b^3+3bd^2-d^3}$.

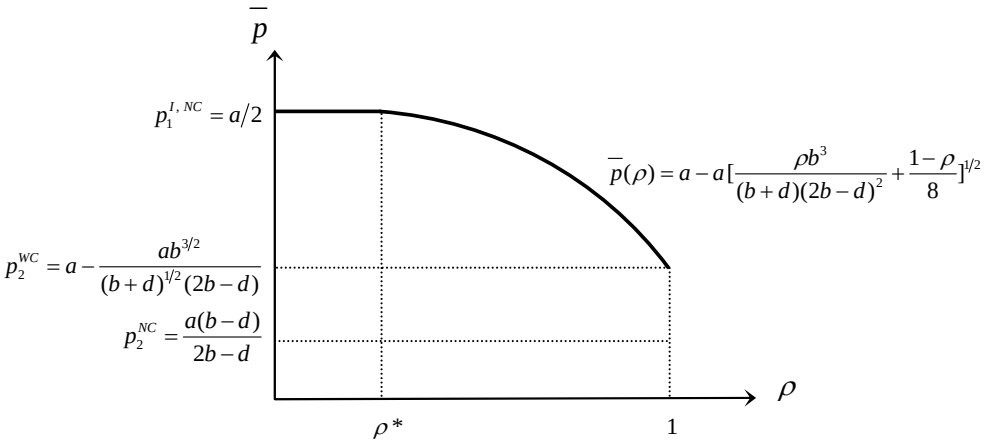

Figure 2.3: Responsiveness of the contract price to uncertainty.

The fact that the entrant appears in period 2 with an exogenous probability less than 1 leaves some room for the incumbent to charge the monopoly price, $p = a/2$, as the contract price. When this probability is lower than the critical level, ρ^*, the incumbent is able to charge the monopoly price, and still convince the buyer to sign the contract. If the entrant is more likely to appear in period 2, then the incumbent has to lower the contract price below the monopoly price. Let us consider the two extreme cases: the case of

independent demands and the homogeneous goods. When the demands are independent, i.e. $d = 0$, then $\rho^* = 1$. This means, when the demands are independent, the incumbent charges the monopoly price in period 2, as it continues to be the only supplier of the product. When the two goods are homogeneous, i.e. $d = b$, then $\rho^* = 1/3$; meaning, when the two goods are homogeneous, the incumbent can charge the monopoly price only if the probability of the entrant appearing in period 2 is less than $1/3$. The lower this probability, the higher the contract price. Also, the incumbent's profit with the contract is inversely related to ρ.

2.5.3 Time Discounting

Until now, it was assumed that the firms and the buyer do not discount future payoffs. In this subsection, I allow for time discounting. Intuitively, this has two effects. First, it will be easier to convince the buyer into the exclusive contract because future surpluses are less important for her now. For this reason one would expect to see a higher contract price, or even a longer contract. However, there is a second effect, which is that the incumbent firm will also value future profits less. Thus, what is going to happen is not immediately clear.

I assume a common discount factor for the incumbent and the buyer, denoted by δ. The incumbent's problem now turns into the following.

$$\begin{aligned} \max_{\overline{p}} \quad (1+\delta)\pi_1^{I,WC}(\overline{p}) \quad \text{subject to} \quad & (1+\delta)CS_1^{WC}(\overline{p}) \geq \delta CS_2^{NC} \\ \text{and} \quad & (1+\delta)\pi_1^{I,WC}(\overline{p}) \geq \pi_1^{I,NC} + \delta\pi_2^{I,NC} \end{aligned} \tag{2.17}$$

To discount future returns to the present, the two parties use the discount factor δ. The following proposition states the solution to the problem in (2.17).

Proposition 2.5.4. *For the problem stated in* (2.17)*, the incumbent sets the contract price as*

$$\overline{p}^* = \begin{cases} a/2 & \text{if } \delta \in [0, \delta^*] \\ a - a\frac{b^{3/2}}{(b+d)^{1/2}(2b-d)}\sqrt{\frac{2\delta}{1+\delta}} & \text{otherwise} \end{cases}$$

where $\delta^* = \frac{4b^3-3bd^2+d^3}{4b^3+3bd^2-d^3}$*, and the contract offer is accepted and exclusion occurs.*

The critical value for the discount factor is plotted with respect to the degree of differentiation. In Figure 2.4, the locus $\delta = \delta^*$ separates the combinations of (d, δ) for which the incumbent offers the monopoly price and the combinations of (d, δ) for which he offers a lower price. The fact that agents discount future payoffs benefits the incumbent firm. With discounting it is possible to set the contract price equal to the monopoly price. As the discount factor decreases, a larger product differentiation is needed in order to set monopoly price as the contract price.

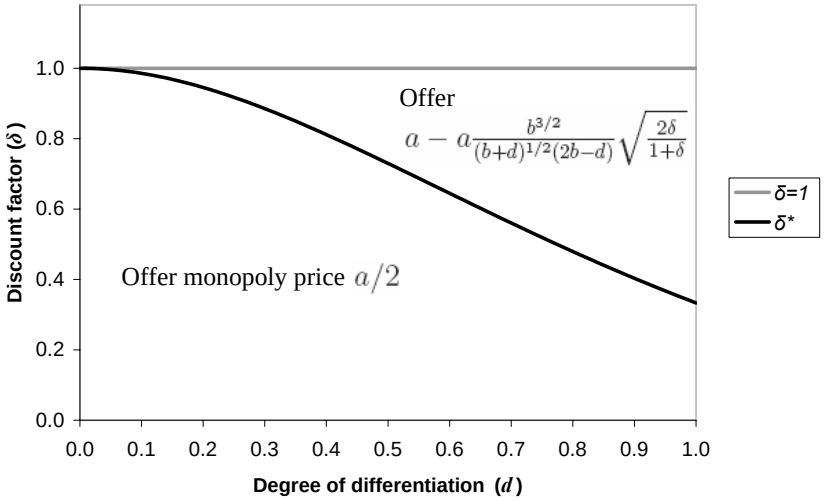

Figure 2.4: Responsiveness of the contract price to the discount factor.

Discounting, just like uncertainty, allows the incumbent to offer the monopoly price for a certain range of parameter values. Discounting makes the buyer worse off, for now she is facing a higher contract price and a lower surplus. Another result which will not be derived here due to its intuitive feature is the following. Consider the set-up of Section 2.5.1; there are more than two periods and every period there is the danger of new entry. Could the incumbent convince the buyer into a longer-term contract to keep the entrant out longer? In Section 2.5.1, it is stated that this won't happen when there is no uncertainty or discounting; the incumbent chooses to deter entry for one period only, letting the entrant come in the following period. However, with discounting it is possible to keep the entrant out forever. This is easy to show. Take extreme case of $\delta = 0$. In equilibrium, the

incumbent chooses monopoly price as the contract price and the entrant is kept out forever. Thus, there is always a small enough discount factor that enables incumbent to get the buyer to sign the contract regardless of how long the interaction period is. The longer the interaction period between the incumbent and the entrant, the more present-oriented the buyer must be in order for her to accept the incumbent's contract.

2.5.4 No Commitment Power

Up until now, it was assumed that the incumbent can commit not to sell to the buyer if she rejects the contract offer. In this subsection, this assumption is relaxed to consider the case where the incumbent has no commitment power, and to see if the results are robust to the commitment assumption. It is important to note that without commitment, the hostage story is not relevant any more. If the incumbent cannot commit to not selling to the buyer, the contract offer has to be such that she still receives both her first and second period consumer surpluses as in the no contract case. In effect, her first period surplus is not held hostage.

Consider again the case in which the buyers are final consumers.[17] The two firms' marginal cost is normalized to zero. Without commitment power, the incumbent has to offer the consumer at least her two-period consumer surplus. He faces the following problem

$$\begin{aligned} \max_{\overline{p}} \quad \pi^{I,WC}(\overline{p}) \quad \text{subject to} \quad & CS^{WC}(\overline{p}) \geq CS_1^{NC} + CS_2^{NC} \\ \text{and} \quad & \pi^{I,WC}(\overline{p}) \geq \pi_1^{I,NC} + \pi_2^{I,NC} \end{aligned} \tag{2.18}$$

The following result is established.

Proposition 2.5.5. *If the incumbent cannot credibly threaten the buyer, then there is a* $\tilde{d} \in [0,b]$ *such that the incumbent does not offer the exclusive contract if* $d \in [0,\tilde{d}]$*, and offers the contract with the contract price* $\overline{p}^* = a - a[\frac{1}{8} + \frac{b^3}{(b+d)(2b-d)^2}]^{1/2}$ *if* $d \in [\tilde{d},b]$.

It is not always profitable for the incumbent to offer the contract, unlike in Proposition 2.3.2. When the incumbent's threat is believed, offering the contract is always profitable

[17] The case where the buyer is the monopoly retailer gives identical results.

than not offering it. The contract is signed and exclusion occurs. However, when the incumbent has no commitment power, the contract price has to be lower because the incumbent has to compensate the consumer for a higher consumer surplus; more specifically the consumer surplus in both periods. This leads to a lower $\pi^{I,WC}$. For high levels of product differentiation, i.e. low levels of d, the incumbent will not make a contract offer and will accommodate entry. When the products are very distinct, it is harder for the incumbent to make up for the large consumer surplus. He just has to lower the contract price so much that the contract is no longer profitable. Thus, the contract will be offered only if the degree of product differentiation is sufficiently low (see Figure 2.1).

When the contract is offered, how does it affect the welfare? Note that the consumer gets the same surplus with and without the contract. Hence, what matters for the welfare is the relative magnitudes of the increase in the incumbent's profit and the loss of the entrant's profit. Comparison of these two gives us the following result.

Proposition 2.5.6. *There is a* $\check{d} \in [0,b]$ *such that* $TS^{WC}(d) \leq TS^{NC}(d)$ *for* $d \in [0,\check{d}]$*, and* $TS^{WC}(d) \geq TS^{NC}(d)$ *for* $d \in [\check{d},b]$.

Lemma 2.5.7. $\tilde{d} \approx 0.11b$ *and* $\check{d} \approx 0.79b$.[18]

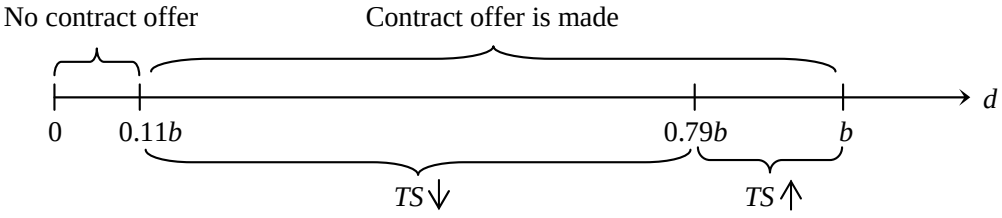

Figure 2.5: Contract offer and welfare.

The incumbent offers the contract only if the two products are sufficiently substitutable. It is important to note from Lemma 2.5.7 that $\tilde{d} < \check{d}$. Thus, there is a range of d where the contract offer is made and the result is welfare reducing, and also a range of d where the contract offer is made and the result is welfare improving. The contract, when offered, is welfare improving only if the products are very close substitutes (see Figure 2.5). The intuition is the same as in Proposition 2.3.4. To sum up, the results

[18]These values are computed using *Maple*.

previously established continue to hold in the no commitment case, but under some parametric restrictions.

2.6 Conclusion

In this paper, I study the effects of long-term exclusive contracts when the products are horizontally differentiated. Some important results are established. Firstly, the monopolist can hold the consumer surplus in the pre-entry period hostage by signing the buyer up for a long-term contract. This occurs when he can credibly threaten the buyer not to sell to her in the pre-entry period. Secondly, when the monopolist has a commitment power, he always finds it profitable to offer the contract no matter what the strength of differentiation of the entrant's product is, and the exclusion occurs. Finally, the contract can be welfare-improving if the level of differentiation is below some certain level, in other words, if the products are very close substitutes. From an antitrust perspective, this implies that there are situations where permission might be granted to firms to sign contracts of this kind if the relevant standard is the total welfare standard. Even though consumer surplus is reduced, this issue can be resolved by a transfer from the incumbent to the consumer.

The case of the buyer as the monopoly retailer is also analyzed. In this case, it is found that the exclusive contract always reduces the welfare. The final consumers are affected adversely because of double marginalization. The increase in the incumbent's profits is not sufficiently large to cover the surplus reduction of the entrant, retailer, and consumers.

The model is further extended to include more periods, uncertainty, discounting, and no commitment power. It is shown that if there are more periods in which the incumbent and the entrant will interact in a Bertrand sense, the incumbent chooses to deter the entry for a limited period of time. It is found that the optimum length of the contract for the three-period model will always be two periods – it is too costly for the incumbent to offer a longer-period contract and keep the entrant out forever. The hostage that the incumbent holds is not sufficiently large to exclude the entrant for all periods. Uncertainty and discounting open up the possibility for a higher contract price or a longer contract. Finally, without commitment power, the same results are established but under some

parametric restrictions.

There are still interesting questions to look at on exclusive contracts. One such question is how downstream competition would affect the optimal contract offered by the incumbent under the hostage story. The case of monopoly retailer is analyzed in this paper. However, if there were two or more retailers in the downstream market, could the incumbent impose an exclusive contract on one or more of the retailers? Would there be a coordination issue between the retailers? Even though there is some recent work on this topic, it does not consider the case of long-term contracts and differentiated products. Also, uncertainty about the entrant's cost, which is the main driving force of Aghion and Bolton's results, has been ignored in recent work. This feature along with the uncertainty about the incumbent's cost could possibly bring a new and interesting signalling dimension into the model.

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Chapter 3

Persuasion or Information? Advertising and Pricing of Image Goods[1]

3.1 Introduction

It is generally accepted that consumption can be a social activity. Consumers' purchase decisions may depend not only on the product's ability to satisfy practical needs, but also its ability to fulfill social needs such as prestige, uniqueness, or the need to communicate a certain image. Research has shown that consumers could place a lower value on a product when more consumers own it. In a laboratory experiment, Worchel, Lee and Adewole (1975) show that this kind of behavior can even exist for products like cookies. This implies that people might choose unique or exclusive items not only for reasons of signaling their wealth or status, but also for the sake of being just different. Advertisements are often designed to appeal to these kinds of consumer needs. Pollay (1984) reports the finding in a study of 2000 randomly selected magazine advertisements that uniqueness appeals are used as a central theme in 10% of magazine advertisements and as a subordinate theme in 23%.

In this paper, I ask how consumers' desire for exclusivity affects the firm's pricing and advertising. The definition of desire for exclusivity, or "snobbishness," follows Leibenstein's (1950) terminology; snobbish consumers are those whose willingness-to-pay for a product goes down as the total number of consumers increases. Snobbishness is more likely to be a significant factor in markets for luxury goods such as jewelry, perfumes, expensive watches, and luxury cars. In these markets, it is believed that some consumers would find the product less valuable if it is consumed by many, and that firms may po-

[1] A version of this chapter will be submitted for publication. Ucar, Sebnem. Persuasion or Information? Advertising and Pricing of Image Goods.

tentially make higher profits if they maintain a high price level in order to keep their customers happy.

The brand may lose its appeal if different market segments become attracted to it, leading to decreased profits for the firm. Let us consider the example of the Cadillac Cimarron. This compact car built by Cadillac was introduced in 1982. Despite the Cimarron's moderate profitability, the Cadillac brand name was tarnished. Buyers of the model came from a market segment which could not afford luxury sized Cadillacs. Owners of luxury sized models lost their sense of the car's exclusivity.[2] This was part of a series of events that drove the division close to bankruptcy in the 1980s. Consequently, the Cimarron was discontinued after 1988. Similarly, Burberry, a British luxury fashion brand, attempted to make the brand relevant to an increasingly-diverse customer base, from businessmen wearing trench coats to trendy women carrying the latest Burberry couture to teenagers wearing Burberry scarves. Repositioning itself around so-called "accessible luxury" yielded short-term gain for the company. In the long run, however, becoming associated with younger, less-affluent customers hurt the company's brand image. The company reported some fairly poor financial results at the end of 2007, although a rival company, Armani, reported a strong year.[3] Tiffany, a U.S. jewelry and silverware company, emphasized its inexpensive Tiffany-branded silver jewelry collection to increase store traffic.[4] This strategy brought teenagers into the store, and consequently made its traditional customers feel marginalized, and damaged the brand image in the early 1990s.

In this paper, I consider these markets with exclusive products, and provide an explanation as to how a firm would choose its price and advertising intensity under various conditions. I also look at why firms might choose different forms of advertising, namely, informative and persuasive/image advertising. Informative advertising is defined as advertising that informs consumers of the existence of the product. Persuasive advertising is traditionally defined as advertising that increases the consumers' willingness-to-pay and pushes out the demand curve. Here, I define what is termed "image advertising" as advertising which seeks to create an image that consumers can identify with. By doing that, I provide foundations for the increases in willingness-to-pay without giving up the assumption of rationality.

[2] See Pitta and Katsanis (1995).

[3] Taken from comments of Eric Newman in a January 2008 *Brandweek* article.

[4] Taken from comments of Aude Lagorce in a February 2008 *MarketWatch* article.

Following these definitions, since any kind of advertising necessarily supplies information about the product's existence, one might wonder why we don't observe image advertising as the only type of advertising; this type both informs *and* persuades consumers.[5] How to explain the fact that we still see informative advertising? There are two explanations. One is that the product may merely offer intrinsic utility (defined as the utility derived directly from consumption) to consumers and provide little scope for the creation of an image that people might care to identify with. For goods of this sort, one would observe only informative advertising from sellers who seek to increase the size of their potential markets. Secondly, informative advertising is usually less costly to produce than persuasive advertising. The creation of an image needs to engage the imagination and also the senses of the target audience.[6] Creating and communicating an image or brand awareness requires creativity as well as sophisticated technology to bring it to reality. On the other hand, an advertisement which just informs or reminds consumers of the product's existence is, in principle, easier to prepare and, therefore, less costly. Even the media used by informative and persuasive advertising are usually different. Firms would be more likely to use television and glossy magazines for persuasive advertising, but employ the radio and the newspaper for informative advertising. For example, according to *Advertising Age*'s 2007 U.S ad spending by category, firms in product categories such as personal care, apparel, cigarettes & tobacco, beer, wine & liquor spend a much greater share of their total advertising budget on TV and magazine commercials; whereas, firms in product categories such as real estate, retail, general services, financial services, gas & oil spend a much greater share of their advertising budget on radio and newspaper commercials (see Table 3.1).

I use Leibenstein's idea of "snob effects" to provide justification for image advertising without giving up the consumer's optimization behavior. The idea of snob effects, which dates back to Veblen's conspicuous consumption concept, states that consumers desire

[5]There are cases in which it is virtually impossible to tell what is advertised if one is not already informed about what the product is. For the persuasive advertising to work, one has to know which product is advertised. The implicit assumption in this paper is that consumers can tell what the product is even if they just see image advertisements.

[6]"A brand is not a brand unless it competes along emotional dimensions. It must symbolize a promise that people believe can be delivered and one they desire to be part of." says Jeffrey Swystun, the global director for a branding consultancy *Interbrand* (taken from *http://www.brandchannel.com/papers_review.asp?sp_id=694* on May 19, 2008). This is not an easy task.

Table 3.1: Share of advertising spending.

	TV & Magazine	**Newspaper & Radio**
Personal care	95.0%	1.3%
Apparel	91.4	2.9
Cigarettes & tobacco	91.0	2.1
Beer, wine & liquor	69.3	12.8
Real estate	23.0	62.6
Retail[a]	45.9	45.1
General services[b]	37.7	42.6
Gas & oil	59.1	30.4
Financial services	46.0	27.8
Average[c]	**67.0**	**18.8**

Note: Calculated using media spending totals from TSN Media Intelligence and Universal McCann's Robert J. Coen for 2007.

[a]Includes discount department & variety stores, department stores, retail, shopping centers & catalog showrooms.

[b]Includes apparel services, business services, beauty shops, doctors, nurses, chiropractors, dentists, hospitals, clinics & medical centers, legal services, rental services, dating services, spectator sporting events, exterminators, electric & water companies.

[c]Average is over 29 industry categories of percentage of advertising spending in a given media.

to own exclusive goods or goods that are not commonly purchased.[7] This effect comes from consumption externality. A consumer's consumption has a direct negative effect on another consumer's utility. However, to receive utility from consuming a product with snob effects, there is need for enough publicity about the product's image or exclusive attributes. Image advertising serves to create this publicity needed to increase consumers' willingness-to-pay. The firm has to take into account the tension between how many people know of the product and how many actually buy it.

I first consider a monopolist's choice of price and advertising intensity if the product in question is a pure image good. Then I allow the good to give both image and intrinsic

[7]Leibenstein (1950) makes a distinction between "Veblen effects" and "snob effects". In both effects, consumers care about their relative standing in the society. However, the former is a function of the price; the latter is a function of the consumption of others. The effect analyzed in this paper is the snob effect.

utility, and see how this affects the firm's choice. Since the good now provides a positive intrinsic utility, there is room for informative advertising. This allows us to analyze the firm's optimal mix of different forms of advertising under various conditions. Lastly, I consider a price-competition duopoly framework with two pure image goods, where the two firms first inform a fraction of the population of the product image, and then set their prices simultaneously. Informing a larger fraction of the population means that those who choose to buy the product will have a higher willingness to pay since there will be more agents to appreciate their purchase. However, price must be set such that only a fraction of the exposure audience actually buys the product. The firm will find the optimal balance between these two forces.

The approach yields some interesting results. First, it is shown that if advertising gets more costly, the firm is forced to lower its price. Second, the inherent nature of the product plays a role in the firm's optimal mix of advertising. Returns to informative advertising will be low if the product in question is of low intrinsic quality. Therefore, the firm will choose a larger share of image advertising. I demonstrate that an increase in snobbishness causes the share of image advertising to decrease if the product is of low quality. Also, the monopolist makes lower profits selling to more snobbish consumers if the product is of high quality. When consumers start to value the product image more, the intrinsic value loses its relative importance, which causes a loss in the willingness-to-pay. Finally, it is shown that the market structure affects the firm's choice of advertising intensity. A multi-product monopolist would advertise more than the two duopolists combined if there are advertising spillovers between image goods. Surprisingly, total welfare is higher under monopoly than under duopoly. This is because more consumers are served under monopoly due to a higher level of advertising intensity.

The paper is organized as follows. In Section 3.2, a brief literature review is given. Section 3.3 lays out a basic model of image goods, and studies various interesting additions to the basic model; particularly, how the income dispersion, the nature of the product, the possibility of informative advertising, and the market structure affect the choice of advertising and price. Section 3.4 concludes with an overview of the findings. The proofs to the propositions are provided in Appendix A.2.

3.2 Literature

This research uses the idea of conspicuous consumption which dates back to Veblen's well-known work *The Theory of the Leisure Class* (1899). In his work, Veblen argues that people use consumption as a means to gain and signal status. Later, Leibenstein (1950) discusses snob effects in a classic article. He argues that the snob effect represents the desire of people to be exclusive or just different from the "common herd."

Amaldoss and Jain (2005a, 2005b) in a series of papers study the pricing of conspicuous goods when the consumer pool is comprised of both snobs and conformists. Conformists are defined as those whose value for a product increases as the number of consumers who buy that product increases. The idea of image advertising in the existence of snob effects is studied by Krähmer (2006). As he puts it, image advertising increases consumers' willingness to pay because consumers value how well-known the product's image is. Krähmer studies this idea in a signaling framework in which there is a matching stage after the purchases are done. Each consumer is randomly matched with a member of the public, referred to as the consumer's social contact. The contact does not choose an action, but only infers the consumer's type from her knowledge of brand names, the consumer's choice, and distribution of prices. After treating image advertising as a signaling device, the paper focuses on its entry deterrence effects. The author shows that an incumbent might strategically overinvest in advertising to deter entry, and competition might be socially undesirable.

Signaling social status or wealth through conspicuous consumption has received a great deal of attention. For instance, Bernheim (1994) considers a model in which status depends on public perception about an individual's predisposition. He shows that when status is sufficiently important relative to intrinsic utility, individuals conforms to a single standard of behavior. Bagwell and Bernheim (1996) study the conditions under which "Veblen effects" would arise from the desire to achieve social status by signaling wealth. In Pesendorfer (1995), sellers create new designs, and buyers like those designs because of their ability to signal buyers' type to other buyers in a dating game. By creating designs, sellers are able to use their products to function as a signal for purchasers, similar to the signaling role of advertising. However in the my setup, advertising, rather than allowing consumption to perform as a signaling device, directly enters the utility function. Therefore, it is used as an instrument at the firm's disposal which lets purchasers know

that there are agents who are aware of the product's image. The need for exclusivity is modeled with the help of consumption externalities, rather than in a signaling framework. This also requires that consumers are image-conscious. Furthermore, I analyze the implications of income inequality, informative advertising, and include a monopoly-duopoly comparison.

This research is also related to categorizing advertisements. It is commonly recognized that advertising influences consumer behavior in different ways. However, there has been a long debate on the categorization of advertisements. There are three main views explaining the effects of advertising on consumers.[8] The *persuasive* view argues that advertising increases consumers' willingness to pay by changing their perception about the product, differentiating products, and creating brand loyalty. As a result, it makes the demand for the advertised good more inelastic, leading to increases in price. The formalization of this view is first offered by Dixit and Norman (1978). In Eaton and White (2002), image advertising acts as a means to solve a coordination problem among similar individuals, who signal their types but find it difficult to choose between many equilibria. The *informative* view claims that advertising informs consumers about the product's existence, characteristics, quality, what it's used for, price etc. Grossman and Shapiro (1984) consider a model of horizontal differentiation in which the firms advertise simultaneously and advertising conveys full and accurate information about the characteristics of the products. In a recent paper, Anderson and Renault (2006) look at the monopoly firm's decision on how much information to release to the consumers about the product. A third view is that advertising is *complementary* to the advertised product. Becker and Murphy (1993) develop a model where advertising enters in the utility function just like any other good. The marginal utility of advertising may be positive, in which case advertising is a "good," or it may be negative, in which case advertising is a "bad." But the marginal utility of the advertised product rises with advertising so that advertising serves to shift out the demand for this product.

A different taxonomy of advertising was introduced by Johnson and Myatt (2006). The authors distinguish between advertising which could be hype or real information. In their work, promotional hype corresponds to traditional views of informative and persuasive advertising, i.e. it shifts out the demand curve. However, real information allows

[8]For an extensive survey of the empirical and theoretical studies of advertising, see Bagwell (2007).

consumers to learn their match with the product's attributes. When consumers' valuations for a product are relatively homogeneous, firms will typically choose to serve a large fraction of potential consumers. The corresponding advertising strategy would be to highlight the existence of the product, or inform the consumers of the general characteristics or uses of the product. Firms will offer "something for everyone." When consumers are heterogeneous, firms will restrict sales to a relatively small niche of potential consumers. A good advertising strategy would be to give real information about the extreme characteristics of the product. Many consumers will hate the product, but those who like it will love it.

In this paper, I use the term image advertising instead of persuasive or complementary advertising, even though all these three views are related. The definition of image advertising follows Krähmer; it is the type of advertising that informs consumers of the image of the good. Following this definition, I examine how firms choose the intensity and the form of advertising, image or information, that they pursue. The firm's advertising choice may depend on the income inequality, the nature of the products,[9] the market structure, and the degree of product differentiation.

3.3 The Model

I start with a basic model of image goods in a monopoly environment, and analyze how the monopolist chooses its price and advertising intensity. Later I slowly build on this basic model by adding some interesting features. The first question is why income inequality might matter for the choice of price and advertising intensity. Then I consider the fact that an image good could provide intrinsic utility in addition to image utility, and analyze its implications. Next, with the introduction of informative advertising, I look at the firm's optimal advertising mix and price. Finally, I present a strategic situation in which two firms producing pure image goods are choosing their advertising and price. A welfare comparison is also included.

[9]Nelson (1970) makes the distinction between search and experience goods. He claims that advertising for experience qualities is dominantly indirect information and advertising for search qualities is dominantly direct information.

3.3.1 Basic Monopoly Model of Image Goods

There are two goods in this economy which identical consumers might choose to consume. Denoted by x is the consumer's consumption of the composite good, the price of which is normalized to 1. There is also an image good, v, that the consumer can choose to consume. The demand for v is 0-1; i.e. she either consumes one unit or none. Its price is denoted by p. The consumer's optimization problem can be expressed in the following general form.

$$\begin{aligned} U = \max_{x,I} \quad & F(x) + I \cdot G\big(n(1-V)\big) \\ & \text{s.t. } x + I \cdot p = m \text{ and } I \in \{0,1\} \end{aligned}$$

The consumer's income is denoted by m. I is an indicator variable, which takes on the value 1 if v is consumed, and zero if it is not. A consumer who is not informed, or who is informed but chooses not to buy v, gets no utility or disutility from it. The function F is differentiable, increasing, and strictly concave in x. The function G is increasing and strictly concave in its argument, $n(1-V)$, where n is the fraction of population informed about product v, and V is the fraction of informed agents who choose to buy. Consumers have a conjecture about the total quantity demanded. The fraction of population who buy product v is given by nV, and $n(1-V)$ is the fraction of informed non-buyers. There is the so-called "snob effect" present in the consumption of the image good.[10] Consumers value this good more if there are fewer buyers. However, they value it more if more people are aware of whatever this product's image is. To analyze the image value in isolation, it is assumed for now that $G(0) = 0$, i.e. product v gives no intrinsic utility. This can happen when $n = 0$ or $V = 1$. In other words, consumers do not get any utility from v if no one knows about its image, or if all informed consumers buy it. In the former case, consumers would not be able to distinguish themselves from others by displaying what they own. In the latter case, they would not feel that the product is exclusive to them. The assumption that $G(0) = 0$ is relaxed later.

As for the firm, n is a choice variable, and can be considered as the target audience. The game played between the firm and the consumers proceeds as follows. First the

[10] See Leibenstein (1950) for more on bandwagon, snob, and Veblen effects.

firm chooses n, which I refer to as advertising intensity.[11] Advertisements randomly reach consumers. Then the price is chosen. Given the advertising intensity and price, consumers choose how much x to consume, and whether or not to purchase v. The number of actual buyers of the image good v is given by nV.

For the rest of the paper, I use the following explicit functional forms for F and G that satisfy the above properties. The consumer's utility if she buys v is given by

$$U = x^{1/2} + b\big(n(1-V)\big)^{1/2}, \quad b > 0$$

subject to the budget constraint, $x + p = m$. How do we get from consumers' utilities to the demand function? In other words, how do we find nV? Below I invoke the equilibrium condition for the calculation of nV.

The unique equilibrium will be interior as long as advertising is not too costly.[12] Consumers' expectation about the quantity demanded comes true, consistent with the rational expectations framework. Thus, they make the right purchase decision and there is no regret *ex post*. The situation resembles a collective-action problem. Here, there is one action which does not directly affect others' utility, namely, not buying. The other action, buying the image good, inflicts a negative externality on other buyers. In equilibrium, both buyers and non-buyers must get the same utility. To show that there can never be equilibria in which all or none of the informed consumers buy the image good, suppose first that all informed consumers buy the good, i.e. $V = 1$. This requires that buying v gives a higher utility than not buying it. Therefore,

$$(m-p)^{1/2} \geq m^{1/2}.$$

This inequality would hold only if the firm chooses $p = 0$. However in that case, the firm's profit is negative for any positive level of advertising. The revenue would be zero since price is zero, and there would be a positive cost associated with advertising. Hence, it is not optimal for the firm to set price equal to zero. Therefore, there cannot be an equilibrium where $V = 1$. Now suppose none of the informed buys the image good, i.e.

[11] The target audience, call it T, can be defined as a function of the advertising intensity, i.e. $T(n)$. For simplicity, I assume $T(n) = n$.

[12] If advertising was too costly, the firm would choose not to advertise. The trivial equilibrium would be that no consumer knows about the product, i.e. $n = 0$ and $V = 0$.

$V = 0$. This requires that not buying v gives a higher utility than buying it. Therefore,

$$(m-p)^{1/2} + bn^{1/2} < m^{1/2}.$$

If the firm chooses a positive price and a positive level of advertising such that the above inequality holds, then its profit would be negative. It does not sell any units but still incurs the cost of advertising. Hence, it is not optimal to do so. The firm instead would choose $n = 0$ and make zero profits. However, in that case, it would be more profitable to increase advertising intensity to induce some consumers to buy. The firm would find a (p,n) combination such that buying and not buying the good give the same amount of utility provided that advertising is not too costly. Therefore, there cannot be an equilibrium where $V = 0$.

In equilibrium, some informed consumers buy and some do not. To have no profitable deviation, informed consumers will be indifferent between buying and not buying, thus the following equality:

$$(m-p)^{1/2} + b\big(n(1-V)\big)^{1/2} = m^{1/2}. \tag{3.1}$$

Solving for V from the above equality, I get

$$V(p,n) = \frac{nb^2 - 2m + p + 2\sqrt{m-p}\sqrt{m}}{nb^2} \tag{3.2}$$

Once again, since $V(p,n)$ gives the fraction of informed buyers for every price and advertising combination, it has to be between $[0,1]$. The expression given by (3.2) is never greater than 1; however, it can take a negative value. For those (p,n) combinations, $V(p,n)$ takes the value zero. Therefore, the $V(p,n)$ function is revised as the following.

$$V(p,n) = \max\left\{\frac{nb^2 - 2m + p + 2\sqrt{m-p}\sqrt{m}}{nb^2}, 0\right\}$$

One can now plot the demand function in a three-dimensional space. The total units demanded, nV, is a function of price and the number of informed agents and, as explained above, is determined in equilibrium. Proposition 3.3.1 states its behavior with respect to its arguments.

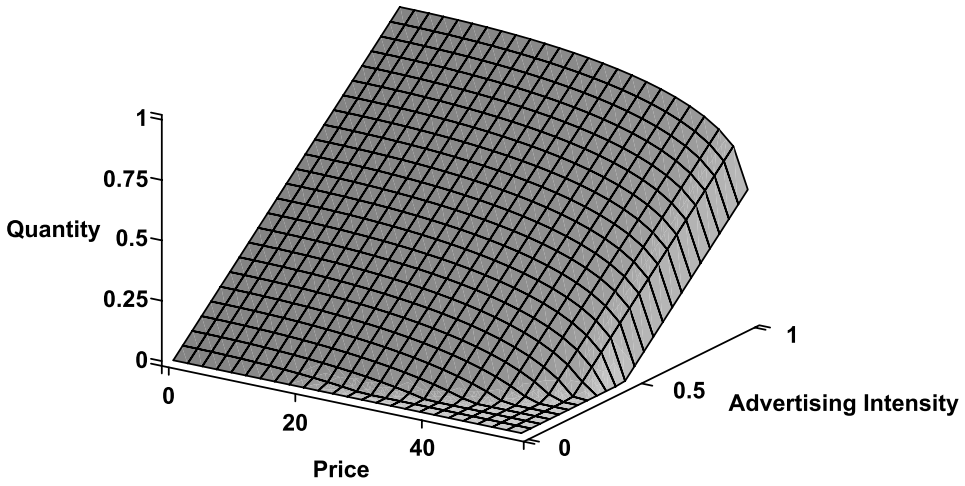

Figure 3.1: Demand for a pure image good.

Proposition 3.3.1. *The demand for the pure image good is decreasing in price, and increasing in advertising intensity.*

It is important to note that unlike Veblen goods, the quantity demanded for a pure image good decreases as price increases. This result is consistent with Leibenstein's (1950) and Amaldoss and Jain's (2005a) theoretical finding that if a market is comprised of only snobs, then demand would not grow as price rises. Snobs are willing to pay a higher price if they expect that the market demand would be lower at the higher price. Such an expectation will be rational if there are some consumers who would demand less when the price is higher, i.e. if there are non-snobbish consumers. Since all consumers are snobbish and rational in the model, in other words they all value being one of the few purchasers of the product, the individual demands will not go up when the total demand goes up.

The monopolist firm's problem is to maximize its profit choosing p and n.

$$\max_{p,n} \quad \pi(p,n) = nV(p,n)p - A(n).$$

where $A(n)$ is the cost of advertising when n fraction of the potential consumers is reached. The typical assumptions about the advertising technology hold; $A(0) = 0$,

$A' > 0$, and $A'' > 0$. From now on, I use $A(n) = an^2/2$ for simplicity.[13]

The two first order conditions (FOC's) coming from the maximization problem of the firm are

$$\Big(1 - \frac{\sqrt{m}}{\sqrt{m-p}}\Big)\frac{p}{b^2} + \frac{nb^2 - 2m + p + 2\sqrt{m-p}\sqrt{m}}{b^2} = 0 \tag{3.3}$$

$$p - an = 0 \tag{3.4}$$

Denote equilibrium price and advertising intensity by p^* and n^*, respectively. Because n^* can never exceed 1, the FOC given by (3.4) translates into

$$n^* = \min\Big\{\frac{p^*}{a}, 1\Big\}. \tag{3.5}$$

There are no closed form solutions for the equilibrium price and level of advertising. However, it is still possible to perform comparative static analysis. Two questions of interest can be settled: What would happen to price and advertising intensity if 1) income increases, and 2) advertising becomes more costly? The answers are stated below.

Proposition 3.3.2. *When there is an interior solution, the equilibrium price and advertising intensity that the monopolist chooses will be higher for a higher level of income. More consumers are served, and the monopolist makes a higher profit.*

Proposition 3.3.3. *When there is an interior solution, higher advertising cost leads to a lower equilibrium price and advertising intensity. Fewer consumers are served, and the monopolist makes a lower profit.*

To understand the effects of each change, some parameter values are taken, and the two FOC's given by (3.3) and (3.5) are plotted. By varying the income and cost of advertising, one can see what happens to the equilibrium price and advertising intensity. Changes in income affects only condition (3.3), and changes in the cost of advertising affects only condition (3.5).

Panel (a) of Figure 3.2 shows that an increase in income causes the concave curve to shift up, leading to an increase in the equilibrium price and advertising intensity. In

[13] An alternative advertising technology might require $A(1) = \infty$. The results do not change qualitatively if this assumption is incorporated.

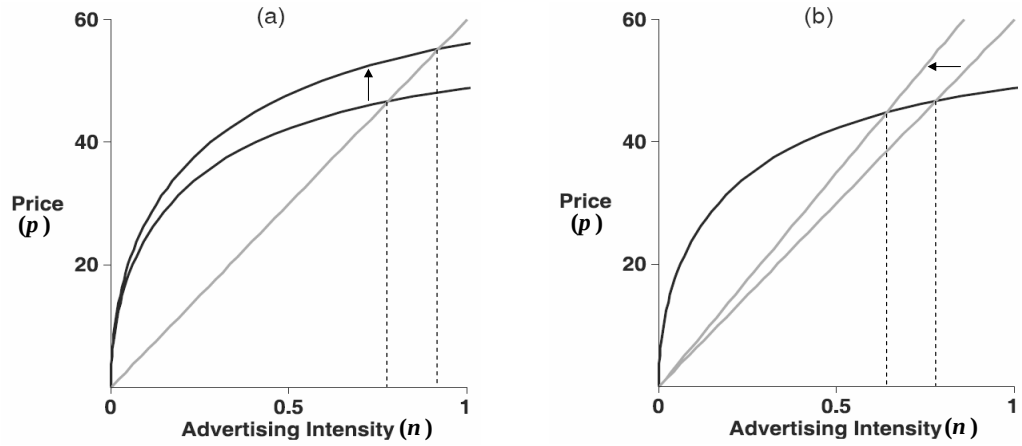

Figure 3.2: (a) Increase in income, (b) Increase in advertising cost.

other words, as the identical income of everyone grows, the firm charges a higher price and advertises more aggressively in equilibrium. Higher income means the monopolist can charge a higher price for its product. Since the return per customer is higher now, he will want to reach more consumers with its advertising. Therefore, he increases the advertising intensity along with the price. With the increase in income, the monopolist serves more consumers, and achieves a higher profit. He exposes consumers to more advertising, increasing their willingness-to-pay, and therefore manages to charge a higher price. Notice that under this setting any comparative statics result for the equilibrium price applies to the equilibrium advertising intensity as long as $n^* < 1$, since the two FOC's tell us that there is a positive relationship between price and advertising.

Panel (b) of Figure 3.2 shows that an increase in the cost of advertising causes the straight line to become steeper, leading to a *reduction* in the equilibrium price and advertising intensity. What is maybe surprising at first is the fact that equilibrium price goes down as advertising becomes more costly. Costly advertising means the firm will choose to advertise less. However, a smaller reach is less desirable for the buyers since they value how well-known the product is. Consumers' willingness-to-pay is reduced. In order to induce them to buy the good, the firm has to lower its price. Therefore, higher advertising cost causes the equilibrium price to be lower, and lower advertising cost increases it. Also, with the increase in the cost of advertising, the monopolist serves fewer consumers, and earns a lower profit.

This is a different result than suggested by Grossman and Shapiro (1984) for the following reason. In their model, advertising is informative; it informs consumers of the existence of the firms' products. When the cost of advertising decreases, firms advertise more. With more advertising, each firm's reach in the market goes up. Because of strategic effects, improved information about the existence of firms leads to reduction of prices. Thus, advertising is pro-competitive; the equilibrium price goes down with more advertising. However in the current model, there is no competition and consumers are image-conscious. In other words, advertising directly enters their utility function. Therefore, an increase in image advertising causes the equilibrium price to increase.

3.3.2 Importance of Income Inequality

This section is to see the implications of income inequality on the monopoly firm's choice of advertising intensity and price. With identical incomes, every agent who receives and advertisement is a potential customer; whereas with nonidentical incomes this is not the case. The question is whether the monopolist will sell to a few rich customers at a high price, or to many at a low price. The utility of consumer i takes the following form if she buys the pure-image product v.

$$U_i = (m_i - p)^{1/2} + b\big(n(1-V)\big)^{1/2}$$

where m_i is distributed uniformly between $\underline{m}$ and $\overline{m}$, i.e. $m_i \sim U[\underline{m}, \overline{m}]$. The budget constraint has to be satisfied as well, i.e. $m_i \geq p$. Given a set of price and advertising intensity, one can find located on this interval a consumer who is indifferent between buying and not buying the product. All consumers with incomes higher than her income will buy the product because buying gives them higher utility. This indifferent consumer's location effectively determines the fraction of informed agents who choose to buy in equilibrium. Thus,

$$V = \frac{\overline{m} - \widetilde{m}_i}{\overline{m} - \underline{m}}$$

where $\widetilde{m}_i$ is the income of the indifferent consumer. Next, I solve for $\widetilde{m}_i$ from the following equation, which equates this consumer's utility from buying and not buying.

$$(\widetilde{m}_i - p)^{1/2} + b\Big[n\big(1 - \frac{\overline{m} - \widetilde{m}_i}{\overline{m} - \underline{m}}\big)\Big]^{1/2} = \widetilde{m}_i{}^{1/2}$$

After expressing the income level of the indifferent consumer in terms of the firm's choice variables of p and n, one can write out the firm's maximization problem.

$$\max_{p,n} \quad \pi = nV(p,n)p - A(n).$$

For comparative statics analysis, there is particular interest in the effect of income inequality on the firm's choice of its strategic variables. Figure 3.3 plots the equilibrium price and advertising intensity as the standard deviation, σ, of income distribution increases while the mean income, $(\overline{m} + \underline{m})/2$, remains the same. The parameter values used are $b = 11$ and $(\overline{m} + \underline{m})/2 = 55$.

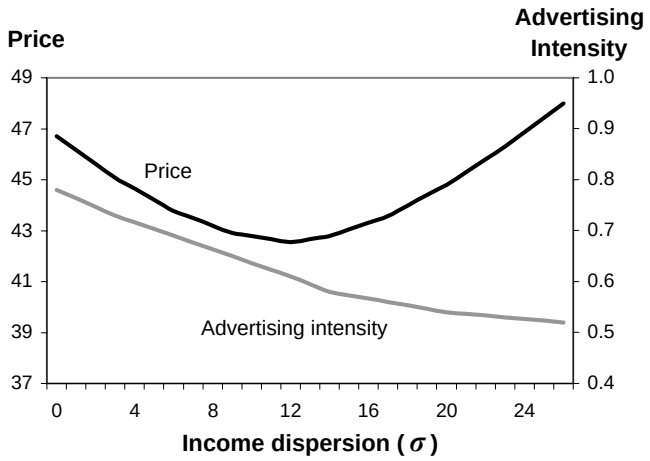

Figure 3.3: Effect of income inequality on price and advertising intensity.

There are a few interesting things to note in this graph. First, as income dispersion grows, the monopolist advertises less. Second, the equilibrium price decreases, and then increases. So unlike what has been shown in the previous section, price and advertising intensity move in opposite directions after a certain point. This is because as the disper-

sion grows, the firm first reacts by lowering its price and advertising intensity to retain customers. However, the firm also lowers its advertising intensity because what it can extract from each buyer is lower. Recall that advertisements reach consumers randomly. This means that the firm cannot target its ads to richer consumers, and this results in a reduction in advertising. As the dispersion in income keeps growing, after a certain point, the increase in dispersion induces an increase in price. This is because the firm finds it more profitable to sell to a few rich customers at a high price than to many at a low price. A testable implication of this behavior would be the following. In a market where exclusivity matters, one expects to see higher prices when income distribution is highly egalitarian or highly inegalitarian. Prices would be lowest when there is moderate dispersion in income distribution. Also, one would expect to see lower levels of advertising as the income inequality increases.

Third, fewer consumers are served when the income is more unevenly distributed, i.e. nV is lower. Reduction in the firm's adverting intensity results in a smaller pool of potential consumers. Fewer of them will know about the product image. However, when the price is lowered as well one would expect that this would bring more consumers. It turns out that the advertising effect dominates the price effect, leading to a reduction in the number of buyers. For larger levels of dispersion, the advertising intensity is lowered and the price is increased. Both of these actions work toward the reduction of the number of actual buyers.

Lastly, the monopolist makes the highest profit when the variance of the income distribution is zero, that is, when consumers have identical incomes. That means the monopolist is better off with lower dispersion of income. This is partially consistent with the results of Johnson and Myatt (2006). They show that firms make higher profits when they are faced with extreme consumer characteristics, i.e. very high or very low levels of dispersion in consumer characteristics. However, in the current model where exclusivity matters, the monopolist is best off with no income inequality, and makes lower profits as income inequality increases. The increase in income disparity leads to a reduction in the return to advertising because of the fact that advertisements are not targetable. Some ads are wasted as not every agent who receives an ad is a potential customer. Some agents cannot even even afford the image good. This leads to a reduction of the monopolist's profit. These arguments are summarized below.

Observation 3.3.1. *As the income inequality grows leaving the mean income the same,*

(a) *the monopolist advertises less;*

(b) *the equilibrium price first decreases and then increases;*

(c) *fewer consumers are served;*

(d) *the monopolist's profit decreases.*

The fact that the monopolist advertises less when income dispersion increases seems somehow puzzling. Why wouldn't the monopolist advertise more intensively? This would increase the willingness-to-pay of those few who can afford to buy, and therefore, the firm would be able to charge a higher price. However, advertising the image serves two purposes here. First, because advertising is persuasive, more advertising means greater willingness-to-pay. Secondly, it informs the consumers of the product image so that the pool of potential buyers increases. With a larger dispersion of income, the ads will be viewed by a larger number of agents who cannot even afford to buy the good. This is because the firm cannot target its ads, which leads to more wasteful advertising. Consequently, the firm cuts back its advertising.

3.3.3 Why the Nature of the Product Matters

So far, I have considered the advertising decision of a monopolist producing a pure image good; i.e. a good which gives only image utility and no intrinsic utility. In this section, I consider a good which gives both image and intrinsic utility. A simple way to do this is to use a utility function of the following form. When the good is consumed, the consumer's utility is

$$U = (m-p)^{1/2} + b\Big[\alpha\big(n(1-V)\big)^{1/2} + (1-\alpha)\bar{v}\Big]$$

where $\bar{v}$ is the intrinsic utility derived from the consumption of good v. This can also be thought of as utility coming from the use value or practical value that the good provides. It can also be interpreted as the value consumers attach to quality. This would mean that higher values of $\bar{v}$ correspond to higher quality. It is an objective value which does not vary with advertising intensity or how many consumers purchase the product. Parameter $\alpha \in [0,1]$ is a taste parameter measuring how snobbish the consumers are. In other words, it indicates the relative importance of image. When $\alpha = 1$, we are back to the pure image

good model; the consumers only care about the image. When $\alpha = 0$, the good gives no image utility but just intrinsic utility, which is the standard good model. Finally, since income dispersion is not the focus of this section, it is assumed that the consumers have identical incomes. This assumption also helps us avoid unnecessary complications.

It is important to note that advertising in this setup acts to inform consumers of the product's image, and not its existence. It is assumed that the consumers are aware of the product's existence but initially uninformed about the image it communicates, in which case n in the consumer's utility is reinterpreted as the fraction of consumers informed about the product image after the firm's advertising. There is one equilibrium in which some consumers buy and some do not buy the good.[14] The fraction of consumers who buy v will be determined by the equality of consumption utility and no consumption utility. Hence,

$$(m-p)^{1/2} + b\Big[\alpha\big(n(1-V)\big)^{1/2} + (1-\alpha)\overline{v}\Big] = m^{1/2}.$$

I solve for $V(p,n)$. Once $V(p,n)$ is known, one can write the firm's profit. The equilibrium price and level of advertising are obtained with the maximization of the firm's profit with respect to these choice variables.

$$\max_{p,n} \quad nV(p,n)p - A(n) \tag{3.6}$$

Before talking about the equilibrium and comparative statics, let us look at the behavior of the demand function with respect to price and advertising intensity.

Proposition 3.3.4. *The demand function for the imperfect image good is weakly decreasing in price and increasing in advertising intensity.*

The demand surface for an imperfect image good is different than that for a pure image good. There is a range of prices for which every informed consumer will buy the good, since the good gives some positive intrinsic utility. Particularly, the total amount

[14] Since the good now gives intrinsic utility, consumers might be willing to pay a positive price even though everyone else is buying the product ($V = 1$), or no one else knows about the product's image ($n = 0$). Thus, there might be equilibria in which everyone or no one buys. In this paper, I focus on interior solutions.

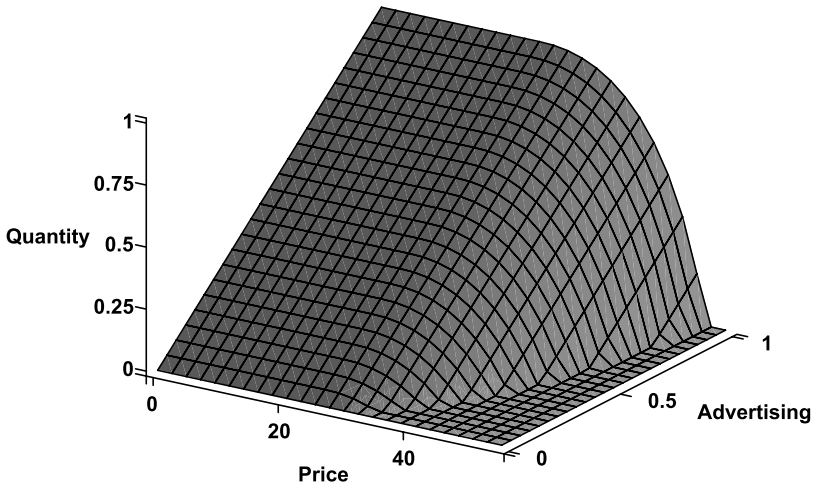

Figure 3.4: Demand for an imperfect image good.

demanded will be equal to n for p such that $(m-p)^{1/2}+b(1-\alpha)\bar{v} \geq m^{1/2}$. The demand starts to fall with price once that critical price level is passed.

A question of interest is, how does an increase in snobbishness affect price, advertising intensity, and profit? In Figure 3.5, one can see the effect of an increase in snobbishness on price, advertising, and firm profit. The parameter values used are $b = 11$, $(\overline{m}+\underline{m})/2 = 55$, $\bar{v} = 2/3$, $1/3$, and $1/5$ for high, medium, and low quality, respectively.

The way α enters the utility function allows us to vary consumers' snobbishness. Snobbish consumers do not care too much about the intrinsic quality of the good, and attach a higher weight to image. Therefore, they have a higher α which puts more weight on image, and less on intrinsic quality. If the product in question is of very high intrinsic quality, then an increase in snobbishness would bring about a reduction in price and advertising intensity. This is because consumers' willingness-to-pay greatly decreases if they are very snobbish. Image is very important for them, but not quality. Hence, no matter how high the quality is, they are not willing to pay a high price for the good. Similarly, if the product has very low quality, then an increase in snobbishness would bring about an increase in price and advertising intensity. In this case, consumers' willingness-to-pay is greatly increased. It turns out that for moderate qualities this monotonicity breaks down.

First, for a given level of snobbishness, the firm charges a higher price and advertises more if the quality is higher. In Figure 3.5, the price and advertising intensity curves

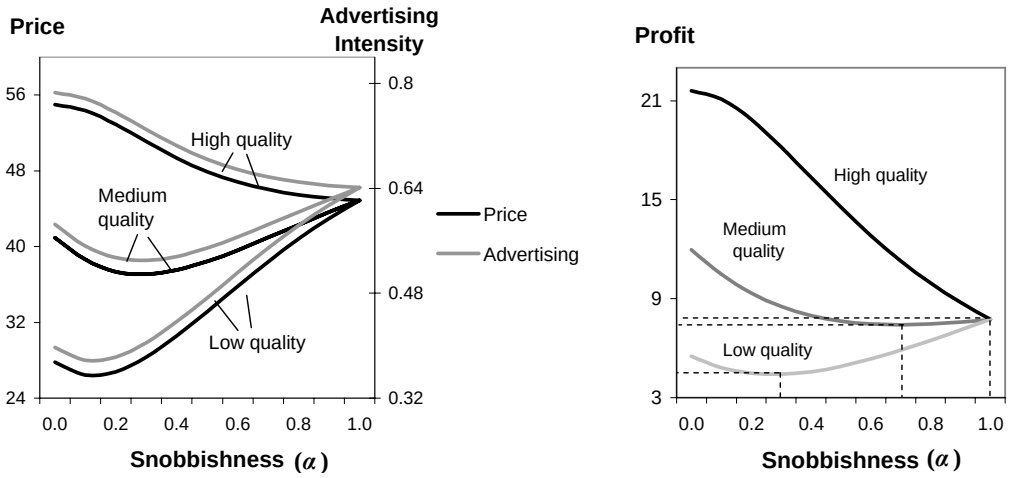

Figure 3.5: Effect of an increase in α on price, advertising intensity, and profit.

for the high quality good always lie above those for low quality. If quality is higher, consumers are willing to pay more for the product, and therefore the firm charges a higher price. Since the return from informing consumers of the product image is higher as well, the advertising intensity will be higher for these goods. Secondly, for moderate qualities as snobbishness increases, the equilibrium price and advertising intensity first decrease then increase. This case can be considered as the mix of the two extreme cases explained above. Starting with low levels of snobbishness, an increase in α takes away weight from quality and puts it on image. Consumers, who now care relatively less about quality, lose their willingness-to-pay for the product. As a response the firm lowers its price and advertising intensity. As α continues to increase, more and more weight is placed on image. The additional utility that image gives to the consumers starts to outweigh the loss in utility of quality. The firm now charges a higher price and advertise to a greater audience since returns to advertising are higher. The propositions are stated below.

Proposition 3.3.5. *When there is an interior solution, for a given level of snobbishness the price and advertising intensity are higher if the product is of higher intrinsic quality.*

Proposition 3.3.6. *When there is an interior solution, for moderate qualities an increase in the level of snobbishness leads to first a reduction then an increase in the price and advertising intensity.*

Even though formal analysis is needed to make further claims, one intuitive result emerges from these graphs. It is assumed that the level of snobbishness is exogenous. However, suppose for a moment that the firm could actually affect it, perhaps by means of product design, advertising or other promotions. Effectively, it could decide how important the good's image will be to the consumers. In that case, the firm would find it profitable to increase the level of snobbishness for the goods that have low intrinsic quality. For goods with higher quality, making the image relatively more important will only lower the profit. This is intuitive if one interprets the good's low use/intrinsic value as availability of close substitutes or unoriginality. In this case, the firm will find it profitable to increase the importance of image. Examples of such goods with a large number of close substitutes and a highly valued image could be designer clothing, perfumes, and luxury cars.

3.3.4 Informative or Image Advertising?

I continue the analysis with the addition of the choice of informative advertising to the current model. It is assumed that the consumers initially do not know about product v. The firm can send out ads of two kinds: a) informative, and b) persuasive/image. I call an ad "informative" if it informs consumers of the product's existence. An ad is an "image" ad if it informs the consumers of the product's image. Informative ads, in principle, are easier to prepare and therefore less costly. The firm is only required to tell/remind the consumers that the product exists, and maybe show the product in the ad. Image ads require creative ideas and technology to bring those ideas to reality in order to capture and convince the viewers. Therefore they are more costly for the firm.[15]

If the firm can send two different kinds of ads, the consumers will be divided into four groups: those who see only the informative ad (Group 1), those who see only the image ad (Group 2), those who see both ads (Group 3), and those who see neither (Group 4). What will be the reaction of these four groups of people after seeing (or not seeing) the ad(s)? Group 1 consumers will know that the product exists but not that it is associated with a particular image. Therefore, they get the intrinsic utility only. Group 2 and 3

[15] A firm, in principle, can send both types of messages in one single ad. However for the purposes of the current model, that would not be an interesting case since it would not be possible for us to say something about the proportion of each. Informative message in the ad would be completely redundant.

consumers both know about the product's image. Therefore, they get both the intrinsic and image utility. Even though Group 2 consumers did not receive an informative ad conveying the fact that the product exists, since they have received "an" ad, they will know that the product exists. For them, having received an informative ad is irrelevant. Effectively, image ads serve both purposes: inform about the existence and the image. However, since they are more costly and the product provides intrinsic utility, there is still room for informative advertising.

The firm first chooses advertising intensity by choosing the fraction of the population reached by informative and image ads. Denote these by n_I and n_P, respectively. Then a fraction $n_I(1-n_P)$ will be in Group 1, a fraction n_P will be in Group 2 and 3, and a fraction $(1-n_I)(1-n_P)$ will be in Group 4. The cost of informative and image advertising is assumed to be given by $A(n_I) = a_I n_I^2/2$ and $A(n_P) = a_P n_P^2/2$, respectively, where $a_I > 0$, $a_P > 0$, and $a_I < a_P$. After the ads have been viewed by consumers, the firm chooses its price, and trade takes place.

Since Group 1 consumers are not aware of the product's image, they do not get image utility. For them, $\alpha = 0$. Their utility depends on their consumption of the composite good and the intrinsic value of the image good, $\bar{v}$. Therefore, they will all buy the product if the following is true. Otherwise, Group 1 consumers will not be served by the firm.

$$(m-p)^{1/2} + b\bar{v} \geq m^{1/2} \quad \Rightarrow \quad p \leq -b^2\bar{v}^2 + 2b\bar{v}\sqrt{m}.$$

Consumers in Groups 2 and 3 are aware of both the existence and the image of product v. They put a positive weight on the product image, i.e. for them $\alpha \in (0,1)$. In other words, their utility depends not only on their consumption of the composite good and the intrinsic value of the image good, but also on how well-known the product image is and on how many customers there are. They will buy the product if the following is true.

$$(m-p)^{1/2} + b\Big[\alpha\big(n_P(1-V)\big)^{1/2} + (1-\alpha)\bar{v}\Big] \geq m^{1/2}$$

As before, there is an interior solution when the above expression holds with strict equality. I solve for $V(p, n_P)$, and write the firm's profit function.

$$\pi(n_I, n_P, p) = \big[n_I(1-n_P) + n_P V(p, n_P)\big]\, p - A(n_I) - A(n_P)$$

The firm has three choice variables, p, n_I, and n_P, which lead to three FOC's. There is one important point to note. By choosing a mix of informative and image advertising, the firm can manipulate the amount of the increase in consumer's willingness-to-pay. Those who are in Group 1 will purchase the product regardless of the intensity of advertising. However, those who are in Groups 2 and 3 are affected by the intensity. Intrinsic quality is not the only element in a product that they would care about since they are now aware of the product image. Therefore, image advertising might even cause devaluation of their total willingness-to-pay for the product because knowledge of image increases their α.

By combining the FOC's, one can write the equilibrium levels of advertising intensity, $n_i^*(p)$, $i = 1,2$, as functions of price. Denote $\widetilde{n}_i = p(a_j - p)/(a_I a_P - p^2)$, $i = I,P$, $j = I,P$, $i \neq j$. Then the equilibrium levels of advertising are given by

$$n_i^*(p) = \begin{cases} \min\{\widetilde{n}_i, 1\} & \text{if} \quad \pi(p, \widetilde{n}_i, \widetilde{n}_j) \geq 0 \\ \\ 0 & \text{if} \quad \pi(p, \widetilde{n}_i, \widetilde{n}_j) < 0. \end{cases}$$

One can solve for the equilibrium price and advertising intensities only numerically. These are plotted in Figure 3.6. The parameter values used are $b = 11$, $(\overline{m} + \underline{m})/2 = 55$, $\overline{v} = 1/2$, $1/3$, and $1/4$ for high, medium, and low quality, respectively.

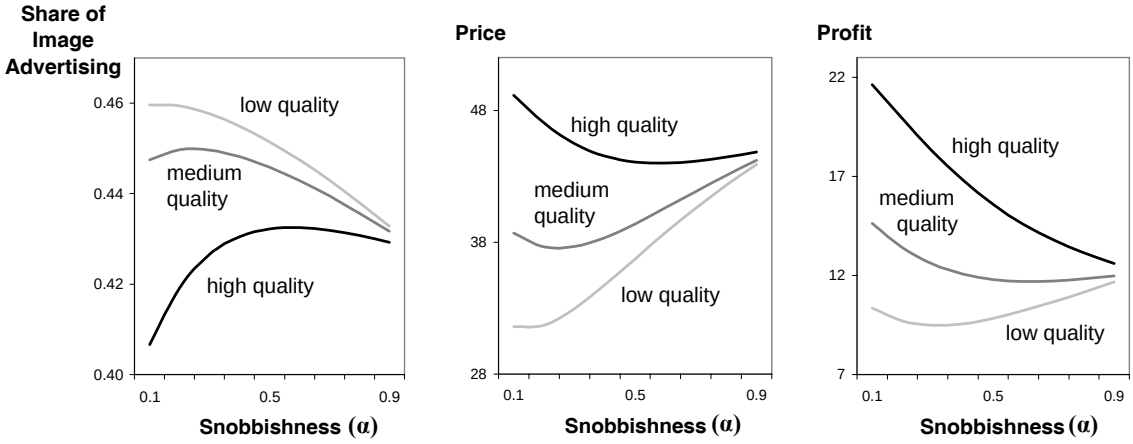

Figure 3.6: Choice of advertising type, price, and profit.

As can be seen from the first graph in Figure 3.6, the higher the intrinsic quality of

the good, the lower the share of image advertising the firm employs. For a given level of snobbishness, as $\bar{v}$ grows, there is greater incentive for the firm to spend its advertising money on informing the consumers of the existence of its product. Therefore, the share of image advertising decreases. In the extreme case, when consumers are fully snobbish and, therefore, do not care about the intrinsic quality of the good at all, the share of image advertising converges for different qualities. This is because the quality will not be a factor in determining the price and advertising levels any more.

What happens to the composition of advertisements if the level of snobbishness increases? In that case, image becomes relatively more important. As can be seen from the second panel, for high qualities the equilibrium price decreases. An increase in snobbishness leads to a reduction in willingness-to-pay because it takes weight away from intrinsic quality and places it on image. As for the firm, this increase leads to an increase in image advertising (see the first panel in Figure 3.6). Image ads, if viewed by those who also view informative ads, cause devaluation of the willingness-to-pay if the product is of high intrinsic quality. Consumers realize that intrinsic quality is not the only product attribute that they would care about. However, the share of image advertising goes up. When consumers are more snobbish, the firm is still better off increasing the share of image advertising because the returns to image advertising are high. The firm is able to extract more from each buyer.

For low qualities, as the level of snobbishness increases, the equilibrium price increases. The utility that consumers get from quality is low. Thus, willingness-to-pay in fact increases when consumers place a smaller weight on intrinsic quality. What is maybe more puzzling at first is that the share of image advertising decreases even though image becomes more important for consumers. The intuition is as follows. Recall that consumers, who receive only informative ads (Group 1 consumers), buy the product regardless of the market demand or advertising intensity. An increase in the share of image advertising would reduce the number of these consumers since some of them would also receive image ads. When this happens, these consumers would become a part of Group 3 consumers (those who receive both ads). Because of the negative externality inflicted on other buyers, only some of them would end up purchasing the product. Image advertising, by letting more consumers know about the image, is effectively causing some agents not to buy. Yet, these agents would have purchased the product had they not seen

the image ads. For this reason the firm lowers the share of image advertising to prevent consumers in Group 1 from joining Group 3. One point to note here is that the firm in fact increases the intensity of both types of advertising. However, informative advertising increases more than image advertising, leading to a reduction in the share of the latter. These arguments are summarized below.

Observation 3.3.2. *When both informative and image advertising are possible, for a given level of snobbishness, the share of image advertising is higher for goods with lower intrinsic quality.*

Observation 3.3.3. *An increase in snobbishness causes the share of image advertising to increase if the product is of high intrinsic quality, and to decrease if the product is of low intrinsic quality.*

Observation 3.3.4. *The monopolist makes lower profits selling a high-quality product to more snobbish consumers.*

3.3.5 Existence of a Strategic Competitor

So far, I have looked at a monopolist's pricing and advertising decisions when the monopolist is producing an image good. In this section, I analyze the case of duopoly. There are two firms, firm 1 and firm 2. Each firm produces a differentiated image good which gives no intrinsic utility (or consumers do not care about quality).

As in the first case considered above, all consumers are identical and each consumer consumes at most one unit of an indivisible image good. After the two firms' advertising efforts, the population is divided into 4 groups: those who see only firm 1's ads (fraction $n_1(1-n_2)$), those who see only firm 2's ads (fraction $n_2(1-n_1)$), those who see both ads (fraction n_1n_2), and those who see none (fraction $(1-n_1)(1-n_2)$). The utility of a consumer who has seen both ads is given by

$$\max\{U_1,U_2,\bar{U}\} \quad \text{where} \quad \begin{aligned} U_1 &= (m-p_1)^{1/2}+b\Big[\big((1-k)n_1+kn_2\big)(1-V_1)\Big]^{1/2} \\ U_2 &= (m-p_2)^{1/2}+b\Big[\big((1-k)n_2+kn_1\big)(1-V_2)\Big]^{1/2} \\ \bar{U} &= m^{1/2} \end{aligned}$$

where p_i is the price of good i, $i = 1,2$, n_i is the advertising intensity of firm i, and $k \in [0,1/2)$ is the spillover parameter. The two firms produce products that are imperfect substitutes of each other in the following sense. A consumer of v_1 gets utility from the fact that v_1 is well-known, as well as from the fact that the rival product is well-known. If, for instance, these two products are BMW and Mercedes, BMW consumers get utility from the fact that many people recognize Mercedes as a high-class car. Wide recognition of Mercedes' image increases the likelihood that BMW's image will be recognized as well. This is because a car which looks similar to a high-class car (BMW in this case) must also be a high-class car. This spillover effect will be larger the closer substitutes the products are. Therefore, one can interpret k as the degree of product differentiation. The interval for k is taken to be $[0,1/2)$. If $k = 0$, then we are back to the so-called "independent" demands framework in the sense that there is no direct effect of each product on one another. If $k = 1/2$, then both products have the same influence on one another. So k could lie anywhere in this interval.

In the Nash equilibrium of this game, no consumer regrets her purchase decision and the firms' choices of price and advertising are profit-maximizing. More explicitly, a consumer who has seen ads from firm 1 only is indifferent between purchasing and not purchasing v_1. Similarly, a consumer who has seen ads from firm 2 only is indifferent between purchasing and not purchasing v_2. Finally, a consumer who has seen ads from both firms is indifferent between purchasing v_1, v_2, and nothing. If this was not the case, then consumers would be switching between products or between purchasing and not, until there is no more incentive to do so, at which point indifference is established. For instance, suppose a group of consumers sees both ads and calculates that v_2 gives higher utility. What happens is that, for a given set of prices, more consumers who are aware of v_2 will start to buy this product, increasing V_2, and therefore decreasing the utility of consuming it. This flow of consumers will stop until v_2 gives as much utility as both v_1 and not buying at all.

To find the equilibrium, I first write the indifference condition of a consumer who has seen ads from both firms. It turns out that in the symmetric Nash equilibrium where the two firms choose the same price and advertising intensity, consumers in all groups are indifferent between the choices available to them.

$$(m-p_1)^{1/2}+b\Big[\big((1-k)n_1+kn_2\big)(1-V_1)\Big]^{1/2}=m^{1/2}$$

Then, I solve for $V_1(p_1,n_1,n_2)$.

$$V_1(p_1,n_1,n_2)=\frac{b^2[(1-k)n_1+kn_2]-2m+p_1+2\sqrt{m-p_1}\sqrt{m}}{b^2[(1-k)n_1+kn_2]}$$

Firm 1's problem is then given by

$$\max_{p_1,n_1} \quad \pi_1=n_1V_1(p_1,n_1,n_2)p_1-A(n_1). \tag{3.7}$$

The firm maximizes its profit with respect to its price and advertising intensity given the rival's price and advertising intensity.[16] I look for a symmetric equilibrium; particularly an equilibrium in which the two firms choose the same price and advertising intensity, i.e. $p_1=p_2$ and $n_1=n_2$.

Before analyzing the results for the duopoly case, let us also look at the multi-product monopoly case to be able to make a comparison between the two. Now suppose both v_1 and v_2 are produced by a single firm. The monopolist's problem is

$$\max_{p_1,n_1,p_2,n_2} \quad \pi_M=n_1V_1(p_1,n_1,n_2)p_1+n_2V_2(p_2,n_2,n_1)p_2-A(n_1)-A(n_2). \tag{3.8}$$

Some results about the duopoly and monopoly cases are given in Table 3.2. The parameter values used are $b=11$ and $(\overline{m}+\underline{m})/2=55$.

As in the standard monopoly-duopoly comparison, the equilibrium prices and profit are higher under monopoly than under duopoly. The monopolist also advertises more. This is because the externalities the products cause on each other are internalized when they are produced by a single firm. According to the current formulation, when firm 1's advertising benefits firm 2, and vice versa. Just like with any positive externality scenario, each firm underadvertises in equilibrium compared to the case of a single firm. However, if both of these products are produced by a monopolist, then this effect is taken into

[16] The first-order conditions are given in the Appendix.

Table 3.2: Comparison of monopoly and duopoly.

	Duopoly		**Monopoly**	
	k=1/3	k=1/2	k=1/3	k=1/2
$p_1 = p_2$	42.80	42.13	43.96	43.96
$n_1 = n_2$	0.52	0.49	0.59	0.59
π_i	6.69	6.55	13.59	13.59
$n_i V_i$	0.40	0.37	0.45	0.45
CS	7.42	7.42	7.42	7.42

account and the equilibrium advertising intensity now maximizes the industry profit.[17]

In either case, consumers get the same consumer surplus (denoted by CS in the table above). This comes from the property of the equilibrium that everyone gets the same utility/CS, regardless of the ads they see, whether they purchase one or the other good, or whether they make a purchase at all. If this was not the case, then there would be switching until consumer indifference was established. What is more interesting is that more consumers are served under monopoly than under duopoly (denoted by $n_i V_i$ in the table above). The monopolist advertises more, causing a higher willingness to pay. Even though it charges higher prices, the advertising effect dominates the price effect, and more consumers end up making a purchase.

Another interesting point emerges from the welfare comparison, which is straightforward to make. Consumers get the same CS under monopoly and duopoly. Hence, the only thing that matters is the change in firm profits/producer surplus. As per the table, the monopolist makes more than the sum of the profits of the two duopolists. Therefore, the total surplus is higher under monopoly. The monopolist, by internalizing the externality in consumption, advertises more. This increases the consumers' willingness to pay. Now the monopolist can charge a higher price for her products to capture all of the extra welfare created, and therefore leaving the consumers as well off. But since he is making a higher profit, the total surplus increases.

Observation 3.3.5. *Monopolist charges higher prices and advertises more than the duopolists. More consumers are served and a higher total surplus is achieved under monopoly*

[17] One can also look at the free-entry equilibrium by assuming a fixed cost of entry for all firms. A low fixed cost would mean that more firms enter the industry. Price and advertising intensity would go down, and fewer consumers would be served.

than under duopoly.

Finally, when products are closer substitutes, i.e. when k is larger, prices and advertising intensity will be lower in the duopoly case since the competition is more intense. Since each firm's effect on the other is higher with a larger k, the firms will underadvertise even more. Their profit will be lower, and they will serve a smaller group of consumers. However, if the market structure is a monopoly, the magnitude of k does not have a relevance in determining the profit maximizing price and advertising intensity for the monopolist.

Observation 3.3.6. *In the duopoly case, if the products are closer substitutes the prices and advertising intensities of the firms will be lower, and the disparity between the number of consumers served under duopoly and monopoly increases.*

3.4 Conclusion

This paper studies a model of image goods with an emphasis on image advertising. If the consumers are image-conscious, this type of advertising increases their willingness-to-pay. Purchasers of the product know that when the firm advertises more intensively, they will be able to distinguish themselves from a larger group of non-buyers who will recognize the product and its image. In addition, because of the presence of negative consumption externalities, there is the so-called "snob effect," i.e. purchasers value exclusivity. The firm chooses its price and advertising mix taking into account these two forces.

Factors, which might affect the choice of advertising intensity, advertising form, and price, are considered. I first analyze the implications of income inequality on the monopoly firm's choice of advertising intensity and price. Some interesting results emerge. First, the monopolist advertises less if income inequality is high. It is less likely that a consumer who has seen the advertisement can afford to buy the product. Consequently, the firm cuts back its advertising. Second, as the income dispersion grows, the price first declines, and then starts to increase. A reduction in price retains many consumers when the income dispersion is low. However, as it grows the firm focuses on richer customers by increasing its price. Third, the monopolist prefers lower income dispersion. He can

sell more units at a moderate price, and make higher profit when consumers have similar incomes.

The inherent nature of the product also plays an important role in the optimal mix of advertising that the firm chooses. Since the returns from informative advertising will be low if the product in question is of low intrinsic quality, the firm will devote a larger share of its advertising to image. Image advertising may, in fact, cause devaluation of the willingness-to-pay by taking weight away from intrinsic quality and placing it on image. I demonstrate that an increase in snobbishness causes the *share* of image advertising to increase if the product is of high quality, and to decrease if the product is of low quality. The group of consumers who view only informative ads buy the product regardless of the advertising intensity or the total number of buyers, whereas only some viewers of image ads purchase the product because of the negative consumption externality. Image advertising, by letting more consumers know about the image, is effectively causing some agents not to buy. As for the monopolist, profits are lower when selling a high-quality product to more snobbish consumers.

Finally, comparing the multi-product monopoly and duopoly cases in the model gives us the following novel insight. With advertising externalities present, the monopolist charges higher prices and advertises in total more than the duopolists. The monopolist serves more consumers than the two duopolists combined. In the current model, the total surplus is higher under monopoly than under duopoly. Consumers are just as well off, but the monopolist makes higher profits than the two duopolists combined. In other words, all else equal, moving from a duopoly to a monopoly would increase the social welfare with pure image goods.

I hope to support the theoretical results with empirical evidence in future research. The result that larger income inequality leads to first a reduction then an increase in prices is very intriguing from an empirical perspective. It is also possible to do an ad content analysis for products where exclusivity matters, identify different forms of advertisements, and look at their shares under various market conditions and consumer characteristics.

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Chapter 4

Macroeconomic Factors as Drivers of Deceptive Advertising: An Empirical Analysis[1]

4.1 Introduction

In this study we attempt to establish a relationship between firm wrongdoing and business cycles. There can be various forms of firm wrongdoing such as antitrust violations, employment discrimination, product liability violations, and patent infringements. Here in this paper our focus is on deceptive advertising.

Lean economic times or times of financial difficulty can be described as periods of economic downturn and contraction, and can be sources of pressure for firms. When demand is expected to be low, firms will be under pressure to maintain today's profits even at the expense of future sales. Giving up already low future sales may be justified by enhancing current profits. One way to increase immediate profits is to engage in illegal activities, such as using deception in advertising. It is our goal to show in this paper that during periods of economic decline the amount of deceptive advertising increases, which is potentially a result of constraints imposed on firms that push them into wrongdoing.

Deception is a common practice in the marketplace. Boush, Friestad, and Wright (2009) report a finding of the U.S. Federal Trade Commission (FTC) surveys that consumer fraud in America victimizes almost 25 million people each year. This is still an underestimate of the actual amount of fraud since it only includes detected and reported deceptions that are illegal. Deception works to the detriment of consumers and society as

[1] A version of this chapter will be submitted for publication. Ucar, Sebnem and Dhar, Tirtha. Macroeconomic Factors as Drivers of Deceptive Advertising: An Empirical Analysis.

a whole. The FTC charges of false and unsubstantiated advertising claims, which can be quite large, are good indicators of the extent of the harm caused by these claims. Recently in a 2009 case, a national retailer CVS Pharmacy, Inc. has agreed to pay nearly $2.8 million to settle Federal Trade Commission charges because of making false and misleading claims that its "AirShield" dietary supplement can prevent cold, fight germs, and boost the immune system.[2] The fine is to be provided by the company as refund to consumers who purchased AirShield products. The cost of misleading and false claims in this case is not only the fact that consumers were misled about the germ-fighting properties of this dietary supplement, but also that treated with it they would feel much more protected against the germs, might take riskier actions, and might be more likely to catch a cold. Quite apart from the costs directly incurred by final consumers, one should also call attention to the loss of trust in advertising credibility and general functioning of markets due to deceptive advertising.

As a measure of deceptive advertising, we use advertising complaints data from National Advertising Division's (NAD) case reports in the United States. NAD, established in 1971, is the investigative arm of the advertising industry's voluntary self-regulation program. NAD receives complaints from consumers, firms, and own initiation to evaluate and investigate national advertising claims for truthfulness and accuracy. The reports detailing each case investigated by NAD are made public on the NAD website. It is these reports that constitute our main data set.

In terms of advertising deception there have been two studies using Federal Trade Commission (FTC) data to evaluate the effectiveness of the FTC's regulation of false and misleading advertising. Peltzman (1981) and Sauer and Leffler (1990) analyze whether the FTC's policies have helped create more credible advertising. Peltzman uses the stock market data to provide evidence that the FTC policy on advertising regulation was effective. The firms which had undergone investigation in his sample lost 3 percent of their market value within a five-day window of the announcement of a false advertising complaint or decision.

Sauer and Leffler's findings confirm those of Peltzman. By using event study techniques, they report an average loss of 3 percent for 31 publicly traded companies against which substantiation complaints were issued. It is calculated that these costs for firms

[2]The details of the case can be found at http://www.ftc.gov/opa/2009/09/cvs.shtm.

can amount to $10 million in 1990 dollars, the year the paper was published.

In a related study to ours, Simpson (1986, 1987) explores the relationship of corporate antitrust crime with business cycle fluctuations and political variations. She shows that high levels of unemployment, downturns in stock price and manufacturing output are positively related to criminality. Here, we focus on a different type of misbehavior – deceptive advertising. To our knowledge, there does not exist a study using the NAD data to explore a possible relationship between deceptive advertising and macroeconomic conditions. Our goal is to make contributions in this respect.

We also investigate how different product characteristics play a role in the decision to use deception in advertising during good and bad economic times. For this, we turn to the literature on search and experience goods. Nelson (1970, 1974) classifies products based on the way consumers are able to assess their characteristics and quality. A product is a search good if consumers can easily determine most of its characteristics prior to purchase. A product is an experience good if its characteristics and quality are difficult to observe in advance and are only ascertained upon consumption. Ford, Smith, and Swasy (1990) report experimental evidence that consumers are more skeptical of experience than search attribute claims. In the current study as well, this distinction in the product characteristics proves to be crucial when it comes to the firms' advertising strategy. We find that sellers of experience goods decrease the amount of deception in good economic times. This is because deception introduces the risk of losing future sales in case it is discovered. Sellers avoid this risk by not advertising deceptively when they expect a high demand. On the other hand, there is incentive for sellers of search goods to increase deception in good economic times. The marginal value of search goes down during these times, leading to less search. This effect is absent for experience goods since the claims cannot be verified by simple search; one needs to purchase and consume the good in order to assess the truthfulness of claims.

It is important to note at this point Sauer and Leffler's definition of type I and type II goods to address advertising credibility in their work. Type I goods are those for which information about product attributes is costly to obtain. Examples are infrequently purchased nondurable goods such as appliances, automobiles, furniture, and office equipment. Type II goods are those for which the information is either known or cheap to obtain via purchase or consumption. Examples are inexpensive and frequently purchased

goods such as cosmetics, foods, soft drinks, and sweets. Sauer and Leffler's classification of goods is along the same lines as Nelson's classification of search and experience goods 20 years before them. The authors then identify a relative increase in the advertising intensity of type I goods following the FTC's advertising substantiation program in the early 1970s. They argue that this finding shows the effectiveness of the FTC's program. First of all, if advertising claims become more credible as a result of a change in the policy, they also become more valuable, and therefore there should be more advertising. Second of all, this effect should be larger for type I goods because informative advertising is more important for these goods. We base our classification of goods on these established approaches to get results related to the amount of false advertising. We finally touch upon the issue of market concentration and how it might be related to the level of deceptive advertising.

Our empirical findings demonstrate that there is a negative relationship between the amount of deceptive advertising and the measure of how well the economy is doing. When we break up the data to take into account the durability of the products, we find that the counter-cyclical relationship is significant only in the case of nondurable goods. We also show that within nondurable goods, the relationship between deception and macroeconomic condition is positive in the case of nondurable search goods, and negative in the case of nondurable experience goods. We argue that the reason for the former finding is that consumers search more during difficult economic times. The reason for the latter finding is that sellers of experience goods can increase profits by deception when bad times are expected since the cost of deception, which is the loss of future sales, during these times is low.

Before continuing with some background on advertising regulation in the U.S., we would like to show two diagrams. In Figure 4.1, we plot the number of total advertising complaints and number of valid complaints in a quarter over the period of 36 years. We define valid complaints as complaints where the advertiser agreed to discontinue or modify the claims at issue, or the case went to court or it was appealed. On average 70.8% of complaints are valid according to our definition. We use the number of total complaints in our analysis.

As a measure of variability in how well the economy is doing, we use the University of Michigan's Index of Consumer Sentiment (ICS). ICS is constructed to measure consumer

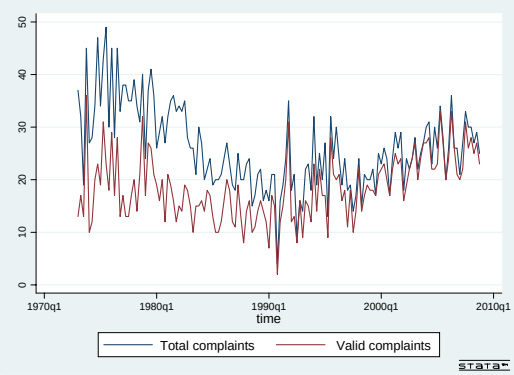

Figure 4.1: Advertising complaints.

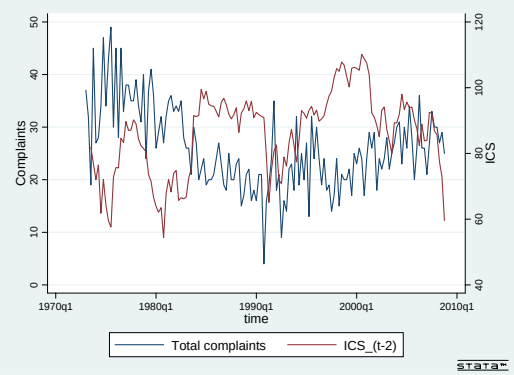

Figure 4.2: Adv. complaints and ICS.

attitudes on the general and personal financial situation. More information on ICS is available in the Data section and in Appendix A.3. We plot the number of total complaints and ICS in Figure 4.2. The negative correlation between these two variables is notable.

The rest of the paper is organized as follows. In Section 4.2, we give background information on the advertising regulation in the U.S. We provide in Section 4.3 a simple theoretical model to understand the forces behind incentives of different industries to false advertise. Section 4.4 talks about the data. The empirical analysis is given in Section 4.5 in two parts: an aggregate analysis and industry-level analysis. Finally, Section 4.6 concludes with an overview of the findings, policy recommendation, and directions for future work. Some detailed information about the data can be found in Appendix A.3.

4.2 Background

In the United States, The Bureau of Consumer Protection of the Federal Trade Commission (FTC) is responsible for protecting consumers against unfair or deceptive practices in commerce to enhance consumer confidence in the marketplace. In 1971, increased government controls and growing consumer criticism gave rise to the formation of a centralized self-regulatory body by the advertising industry – the National Advertising Review Council (NARC) was founded. NARC establishes the policies and procedures for the National Advertising Division (NAD) and Children's Advertising Review Unit (CARU), which serve as the investigative arms of the advertising industry's voluntary

self-regulation program. More particularly, NAD evaluates and investigates national advertising claims for truthfulness and accuracy in an attempt to foster public confidence in advertising credibility. NAD's sole source of funding is derived from membership fees paid to the Council of Better Business Bureau (CBBB).[3]

The complaints come from other advertisers and consumers, as well as NAD's own monitoring efforts and initiation. The challenger is asked to enclose originals or photocopies of newspaper or magazine ads. If the advertising was on radio or television, the challenger is asked to be specific about the name of the product and company, the claims at issue, and where and when the advertisement appeared. It is free for consumers to file a complaint. There is a filing fee of $2,500 for companies which are CBBB members, and $6,000 for non-members. If in the end the advertiser disagrees with NAD's compliance findings and refuses to make modifications recommended by NAD, the matter is referred to the National Advertising Review Board, which is the self-regulation program's appeal body, or to the appropriate government agency such as FTC or FDA.

NAD has dealt with more than 3700 advertising claims over the past 36 years, averaging to about 100 cases each year. On the other hand, the FTC deals with criminally fraudulent cases and situations where there is a substantial economic impact on consumers, making the number of cases much smaller. NAD complaints data provides us with more data points, and therefore, is more suitable for a business cycle study. NAD handles cases that are not extreme, but still selects only serious complaints for formal inquiry. "Frivolous complaints" and "fishing expeditions" are rejected from the outset, and do not make it to our data set (Harker, 1998). An important implication of this is that most complaints are honest, i.e. there should not be substantial strategic considerations when rivals are filing complaints. NAD provides a more private and less expensive alternative to the FTC for resolving disputes about advertising claims. Also, a written decision by NAD is provided within 60 business days, making the process much faster than litigation.

Most complaints come from rival firms. For the entire period of 36 years, we have 3,756 NAD case reports, approximately 43% of which are filed by rival firms. The per-

[3]CBBB is a non-profit private business franchise of local Better Business Bureau organizations based in the United States and Canada and works toward the more general purpose of fostering a fair and effective marketplace.

centage of each group of challengers is given in Table 4.1. When we exclude early years,[4] the percentage of rival complaints goes up to 69%. This is expected given the fact that firms naturally watch their competitors' marketing strategies very closely. Consumer complaints constitute 6.2% of all complaints for the entire period. The low percentage of consumer complaints has been raising some concerns about the self-regulatory program not having sufficient public input in the decisions made (Armstrong and Ozanne, 1983). Some are concerned that whether an organization funded by the advertising industry itself could objectively evaluate advertising claims. It is true that consumers appear to rarely file complaints with NAD. It may be the case that consumers complain to the local Better Business Bureaus, which shows up as complaints made by BBB. Another reason might be that the cost of making a complaint for a consumer exceeds the benefit. If the claims at issue are found misleading or false as the result of a complaint, the consumer as a complainant does not make a large pecuniary gain. The punishment for the advertiser is usually modification or discontinuation of the claims. Thus, the consumer's transaction cost might exceed the benefit of making a complaint.

Table 4.1: Source of complaints.

Challenger	**Observations**	**Share**
Consumer	231	6.2%
NAD & BBB[a]	1,159	30.9
Rival	1,606	42.8
Not Specified	760	20.2
Total	3,756	100.0

[a] BBB refers to the local Better Business Bureaus.

Even though there is the lack of public input, the strengths of the self-regulatory system cannot be ignored. It serves as relief to the regulatory workload, prevention of overregulation; it is a timely and cost-effective alternative. NAD is well-respected by industry participants, and constantly receives and processes complaints filed by established firms in various industries. The evidence shows that advertisers comply with its recom-

[4] A reason to do that is the fact that NAD used to file complaints in the early years of the establishment just to get the process of self-regulation going.

mendations 90.6% of the time (see Table 4.2). Also for our purposes, the fact that NAD might be maintaining a low public profile does not represent a problem.

Table 4.2: Response to NAD's recommendations for valid complaints.

	Challenger				
Response[a]	**Consumer**	**NAD**	**Rival**	**Not Speci**	**Total**
Agree & disc clos	91.9%	91.4%	88.2%	98.1%	90.6%
Appealed	1.2	1.7	5.1	1.6	3.4
Extension	0.6	1.3	1.1	0.0	1.0
Jurisdiction	1.2	2.6	1.7	0.3	1.8
Referred	5.0	3.0	4.0	0.0	3.2
Total number	161	822	1,323	318	2,624

[a] **Agree:** The company "agrees" to make the changes (even if most of the time they technically disagree with NAD's decision, they don't appeal). **Appealed:** Advertiser takes it to NARB. **Discretionary closure:** NAD started an investigation but the case was closed before NAD could make a final decision. This is usually because the company said that it had already discontinued the ad or that it was going to discontinue it anyways. **Extension:** NAD has asked for substantiation and didn't receive any in the allotted time (2 weeks) but they feel the company deserves a bit more time (often company says they'll provide by the next deadline). **Jurisdiction:** There is a pending litigation or an existing FTC inquiry. **Referred:** NAD hands the case to the FTC, FDA or the like.

4.3 Theoretical Consideration

In this section, we present a simple model of advertising decision as a framework to think about the empirical work to follow. Our model follows Peltzman (1981). The main issue we would like to explore with the model is the relationship between the macroeconomic conditions and the amount of deception. We present a two-period model where the firm decides on how much deception to use in its advertising at the beginning of period 1. This decision affects the sales in both period 1 and 2. There is no new advertising in period 2.

Let there be N_i potential buyers for a firm's product in period i. Each buys 1 unit at a price of \$1 in any period. Notice that the price is not a decision variable. By formulating the firm's problem this way, we focus on the profit-maximizing amount of deception. The marginal cost of production for the firm is assumed to be constant, and normalized

to zero. We further assume that the cost of advertising is fixed and therefore ignored.[5] The firm's profit today can be written as

$$\pi_1 = N_1 p(c,s)$$

where $p(c,s)$ is the probability that a potential buyer is convinced and buys the product, c being the level of deception, and s being a measure of how dominant the search characteristics of the product are. Variable c lies in the interval $[0,1)$. The higher the level of exaggeration, the higher the number of potential buyers who are convinced to buy the product, i.e. $p_c > 0$. An example of $c = 0$ would be something like "*DermaSilk is an anti-wrinkle cream*," and an example of c close to 1 would be something like "*A revolutionary, age-defying anti-wrinkle cream. It's like getting a facelift without the invasive surgery. Turn back the years with DermaSilk.*"[6] The probability that a potential buyer buys the product after seeing an ad also depends on the product characteristics, which is denoted by $s \in [0,1]$. In this case, $s = 0$ refers to pure experience goods or goods with only experience characteristics, and $s = 1$ refers to pure search goods or goods with only search characteristics. Once again, search characteristics can be verified prior to purchase, such as color and material of clothes, size and sturdiness of furniture. It is more difficult to deceive a potential buyer if the product in question has more of these characteristics. Therefore we would have $p_{cs} < 0$.

The benefit of deception is that more potential buyers are convinced to buy the product; therefore, the sales go up. The cost of deception is that it might be discovered, either by consumers who find out that the product does not perform as was promised in the ad, by rival firms who closely watch claims about product performance, or by the advertising regulatory agency. In case of discovery, some consumers will switch away from the product. To capture this, we write tomorrow's profit as

$$\pi_2 = N_2 p(c,s) h(c)$$

[5] In Peltzman, the contact function, $g(A)$, maps the amount of advertising, A, to the number of potential buyers. However, we are not interested in the amount of advertising the firm would undertake. Rather, we suppose that the firm advertises at the same intensity but decides on the content only.

[6] Taken from NAD case report #4926 released on October 31, 2008. NAD recommended that the claims "A revolutionary, age-defying anti-wrinkle supplement," "It's like getting a facelift without the invasive surgery," "Turn back the years with DermaSilk" among others be discontinued.

where $h(c)$ is the probability that a buyer remains loyal.[7] More exaggeration means more disappointment on the side of the consumers, i.e. $h_c < 0$. Now that we have today's and tomorrow's profits, we can write the total profit.

$$\pi = \pi_1 + \pi_2 = N_1 p(c,s) + \delta N_2 p(c,s) h(c)$$

where $\delta \in [0,1]$ is the discount factor.

The firm chooses a level of deception/exaggeration to maximize its total profit. The first-order condition is

$$\pi_c = N_1 p_c + \delta N_2 (p_c h + p h_c) = 0, \tag{4.1}$$

or expressed differently,

$$\pi_c = p_c [N_1 + \delta N_2 h(c)] + \delta N_2 p(c,s) h_c = 0. \tag{4.2}$$

The first and the second terms in (4.2) are the marginal revenue and the marginal cost of deception, respectively. Denote by c^* the profit-maximizing amount of deception. Since we do not take explicit functional forms, it is not possible to get a closed form solution for c^*. One quick observation, though, is that the firm would choose maximum deception/exaggeration, $c = 1$, if future profits were not important, or if $\delta = 0$. If future profits were as important as today's profits, i.e. $\delta = 1$, the firm would choose $c \in (0,1)$ determined by the first order condition.

Now we turn to our question of interest, which is the relationship between the amount of deception chosen by the firm and the general economic condition. An economy in a negative growth trajectory can be interpreted as the condition $N_1 > N_2$, i.e. demand next period is lower than demand this period. If this is the case, then after using (4.1) and some manipulation we get the following proposition.

Proposition 4.3.1. *When the economy is moving into a recession, i.e. when $N_1 > N_2$, the firm increases its amount of deception.*

[7] $1 - h(c)$ can be interpreted as the probability of detection.

Proof. If $N_1 > N_2$, then from (4.1) we have

$$p_c < -\delta(p_c h + p h_c).$$

Denote by η_{pc} the deception-elasticity of $p(c,s)$, and by η_{hc} the deception-elasticity of $h(c)$. Multiply both sides of the above inequality by $\frac{c}{p}$ to get

$$\eta_{pc} < -\delta(h\eta_{pc} + c h_c).$$

This can be rearranged to get

$$\delta h(\eta_{pc} + \eta_{hc}) + \eta_{pc} < 0.$$

Since $\eta_{pc} > 0$ by construction, we have

$$\eta_{pc} + \eta_{hc} < 0.$$

Therefore, the loss elasticity of next period is larger than the gain elasticity.

□

As we have explained before, there is a cost and a benefit associated with deception. Deception increases the pool of actual buyers. However, false claims can be discovered leading to the loss of customers, and therefore, future sales. The proposition states that when the economy is moving into a recession, the equilibrium elasticity of the *h* function is larger than the equilibrium elasticity of the f function. This means that the penalty for deception in the next period is severe. In this case, the firm can take advantage of the higher sales today by advertising deceptively and making the most of the higher demand this period. Similarly, when the economy is moving into a boom, the equilibrium elasticity of the p function is larger than that of the *h* function. Since this means the penalty for deception in the next period is not severe, the firm should deceive later instead of in the current period. Below is our first hypothesis.

Hypothesis 4.3.1. *The amount of deception is higher when the economy is moving into a recession.*

Nelson (1974) shows that the incentive for false advertising is likely to be greater for

sellers of experience goods than for sellers of search goods, since claims about search characteristics are easier to verify by consumers prior to purchase.[8] Exaggeration about these characteristics will be detected more easily. Our model produces this result as well. If deception is easier to detect for search goods, then it is more difficult for the firm to get away with exaggerated claims, i.e. $p_{cs} < 0$. To see the resulting change in c^*, we differentiate π_c with respect to s.

$$\pi_{cs} = N_1 p_{cs} + \delta N_2 (p_{cs} h + p_s h_c).$$

To make this expression workable, let us take some functional forms for $p(c,s)$ and $h(c)$. Assume $p(c,s) = c - cs + F$ where F is a positive constant in the appropriate range such that $p(c,s) \in (0,1]$, and $h(c) = 1 - c$.[9] Given these, $p_c > 0$, $h_c < 0$, and $p_{cs} < 0$ are satisfied. Using the first order condition given by (4.1), we substitute for N_2 to get

$$\pi_{cs} = N_1 \left(-1 + \frac{p_c (c h_c + h)}{p_c h + p h_c} \right). \tag{4.3}$$

The sign of the expression in (4.3) depends on whether p_c is greater or less than $p(c,s)/c$. Since it is the case that no exaggeration/deception still produces some sales, i.e. $p(0,s) > 0$, the marginal gain to deception is less than the average. This means $\pi_{cs} < 0$, i.e. the marginal profit from deception decreases as search characteristics increase. This, in turn, means if search characteristics are more dominant, the firm chooses a lower level of deception. Thus, we have our second hypothesis.

Hypothesis 4.3.2. *In equilibrium, there is more deception in experience goods industries than in search goods industries, i.e.* $\pi_{cs} < 0$.

We would like to discuss one potentially crucial issue, namely, the issue of market concentration. There is a huge literature that developed in the 1960s and 1970s trying to establish a relationship between advertising intensity and concentration.[10] However,

[8] Most search goods are low-frequency purchases. Because of this, loyalty is not a major concern for these goods. However, $h(c)$ in our model can still be interpreted as the "word-of-mouth" effect. More particularly, it is the probability that a buyer recommends the product to another buyer (and the product will be recommended if the claims are discovered to be true).

[9] These functional forms are in line with Peltzman's (1981) assumptions about the derivatives of the p and h functions.

[10] See Bagwell (2007) for an extensive survey of this literature.

there haven't been any firm conclusions reached by these studies. Market concentration can obviously have an impact on the amount of firm wrongdoing. In highly concentrated markets, it is easier for few powerful firms to manipulate market outcomes such as price and quantity. These firms can also use deceptive advertising as a tool to gain advantage over competitors. The opposite may also be true. In less concentrated markets where firms are similar in size and power, and have no influence on prices, deceptive advertising might be one of the few tools they can use to gain some advantage. This might cause higher levels of deception in less concentrated markets. We attempt to find an answer to this issue in the Empirical Analysis section.

4.4 Data

Our main data set comes from National Advertising Division's case reports of the U.S. cases. After a case is resolved, a case report is made public on NAD's website. NAD began issuing these reports in January 1973. Thus, we have case reports for the time period 1973-2008. The length, content and tone of the reports have changed over the years. Early reports were very short (as short as one sentence). As restrictions on NAD reporting were lifted, the reports became much longer (as long as 30 pages) and the format was standardized. A full report provides discussion of the itemized claims, the media in which the ad appeared, who the challenger was, the basis of the complaint, the dialogue between NAD and the advertiser, information supplied by the advertiser, NAD's decision, and the advertiser's response.

There are various ways to measure macroeconomic conditions or business cycles. The real GDP growth, recession dummy, and level of employment are among the possible variables. The problem with these variables is that they can be too crude for what we would like to measure. For instance, a rule of thumb in identifying a recession is simply a period when GDP falls for at least two quarters. However, recessions differ in severity, particularly, in depth and duration. It is unreasonable to expect that each economic contraction would affect businesses in a similar way. Therefore, we do not use recession dummy as the measure of the economic condition.[11]

[11] Simpson (1987) creates a monotonic index that combines measures of cycle duration and depth. Cycle depth was weighed twice as important as duration based on Moore (1980). Although this index is still

Our measure of the economic condition is the Index of Consumer Sentiment (ICS) of the University of Michigan Survey of Consumers, which we believe is more comprehensive than the rule of thumb used to define a recession. ICS assesses the level of optimism/pessimism in the consumer's mind, and consumer attitudes on the general and personal financial situation. Economic optimism promotes consumer confidence, which in turn creates willingness to make big purchases. On the contrary, uncertainty and pessimism slows down the economy by diminishing expenditures and building savings.[12]

The predictive power of ICS has already been established in a number of studies. Howrey (2001) finds that ICS, either by itself or in combination with other economic indicators, is a statistically significant predictor of the future rate of growth of real GDP and the probability of recession. Qui and Welch (2006) show that although consumers polled for this survey are not asked for their views on securities prices, changes in ICS is highly correlated with changes in UBS/Gallup index, which surveys randomly selected investor households. Carroll, Fuhrer, and Wilcox (1994) present strong evidence that lagged consumer sentiment has explanatory power for current changes in household spending. Moreover, the Index of Consumer Expectations (ICE), which is a component of ICS, is included in the Leading Indicator Composite Index published by the U.S. Department of Commerce. This is a significant confirmation of the index's capabilities for understanding and forecasting changes in the American economy.

Quarterly data for ICS is available at the University of Michigan Survey of Consumers' website (http://www.sca.isr.umich.edu/). The way it is constructed is as follows. Each month, a minimum of 500 households are contacted by phone to answer 50 core questions. These questions cover three broad areas of consumer sentiment: personal finances, business conditions, and buying conditions.[13]

The U.S advertising expenditure data mainly comes from Robert J. Coen who has been predicting and following trends for advertising spending since 1948 in the U.S. Coen's advertising data were published in the U.S. Census Bureau's *Historical Statistics of the United States, Colonial Times to 1970*. We use an augmented version of Coen's

crude, it is theoretically more attractive than a recession dummy. Here, we opt for another variable – the index of consumer sentiment.

[12]More information about the reliability and uses of this index can be found on the University of Michigan Survey of Consumers' website (http://www.sca.isr.umich.edu/).

[13]More information about the survey questions is in Appendix A.3.

data in this study, which is available at http://purplemotes.net/2008/09/14/us-advertising-expenditure-data/.

Finally, we use Compustat data to calculate the market concentration measure. Our definition of a market follows that of the US Census Bureau. Each 4-digit SIC code constitutes a market. We collect firm-level data from Compustat on sales revenue of publicly traded companies. Then based on the 4-digit SIC codes, we use the firm level revenue measure to estimate market shares and concentration measures, i.e. the Herfindahl-Hirschman Index[14] (HHI_{it}) and four-firm concentration ratios.[15] The correlation between the two measures in our data is 0.72. We only include HHI in what follows.

HHI is also available in the Census of the US economy. However, the time-series aspect of the data is weak since it is only available for the census years. Compustat data allows us to calculate HHI on a quarterly basis. There are quite a few studies using Compustat data for the purpose of calculating HHI even though HHI calculated this way has some limitations (see Ali, Klasa, and Yeung (2009) and references therein for more on this). First of all, Compustat data only covers publicly traded companies. Results we obtain should be considered with this caveat in mind. Second of all, there is missing data because not all companies report their sales every quarter due to various reasons. Missing data might prove to be important as explained in the next section.

4.5 Empirical Analysis

In this section, we test our hypotheses regarding the relationship between macroeconomic conditions and the amount of false advertising. We distinguish between different types of goods in an effort to identify the industries where the effect is larger.We start with the aggregate analysis which allows us to use all NAD cases for the entire period of 1973-2008. Our goal is to identify some general trends in the data. Next we turn our attention to the industries where we are able to control for product type and industry

[14]HHI is an economic concept widely applied in competition law and antitrust. It is defined as the sum of the squares of the market shares of the 50 largest firms (or summed over all the firms if there are fewer than 50) within the industry, where the market shares are expressed as fractions. The value declines with the number of firms and increases with the inequality among the shares of a given number of firms.

[15]The four-firm concentration ratio is calculated as the sum of the market shares of the four largest firms in the industry.

characteristics. A panel-data structure is adopted covering only the period of 1997-2008 due to the availability of industry-level variables.

4.5.1 Aggregate Analysis

Our main data set cover years 1973-2008, which is a sufficiently long period to look at the relationship between macroeconomic conditions and the amount of false advertising. The primary outcome variable that is examined is the number of advertising complaints in a quarter. To be able to make causal inferences, we need to establish that the economic condition is exogenous to the amount of false advertising. One of the hypotheses we have developed is that as economic conditions worsen, firms will care less about future profits and more about profits today. This will make them more aggressive in their advertising, leading to a greater number of false claims. It is possible that the direction of causality is reversed. When firms advertise deceptively, general trust in the economy may fall, which in turn may lead to bad economic conditions. However, we believe that the effect of deceptive advertising on the general macroeconomic condition is minor. Consumer sentiment as a measure of the macroeconomic condition has a very broad scope, whereas our dependent variable concerns only the advertising sector.

The basic reduced form model is:

$$complaints_t = \beta_0 + \beta_1 adexp_t + \beta_2 sentiment_t + \beta_3 t + u_t$$

where $complaints_t$ is the quarterly number of complaints, $adexp_t$ is the total annual advertising expenditure, and $sentiment_t$ is the index of consumer sentiment in a given quarter. We also include a time trend, t. The main focus is the sign and magnitude of β_2, the marginal effect of the variable capturing the macroeconomic condition on false advertising.

Table 4.3 shows the summary statistics for the number of complaints in a quarter and consumer sentiment measures. We have constructed quarterly data for the number of complaints over 36 years. As can be seen from the table, valid complaints constitute approximately 71% of total complaints over this period. The Index of Consumer Sentiment (ICS), and its components Index of Current Economic Conditions (ICC) and Index of Consumer Expectations (ICE) are very highly correlated. When each of the three indices

Table 4.3: Summary statistics.

Variable[a]	**Mean**	**St dev**	**Minimum**	**Maximum**
Total complaints	26.08	7.81	4	49
Valid complaints	18.46	6.12	2	36
ICS	85.82	12.60	54.40	110.10
ICC	97.51	12.42	61.80	118.60
ICE	78.30	13.48	47.60	106

[a]The number of observations is 144.

are used the results do not change substantially. Therefore, we only report results using ICS in our analysis. ICS and its components are defined in detail in Appendix A.3.

Table 4.4 shows our basic regression where we control for the level of activity in the advertising sector and include a time trend. Because of autocorrelation of the error terms, OLS estimation creates invalid standard errors. We correct for it by using the Prais-Winsten transformation, which uses the generalized least-squares method where errors are assumed to follow a first-order autoregressive process. We also include three lags of the dependent variable in each regression.[16] First, we observe that there is a positive and significant relationship between the current number of complaints and the number of complaints two quarters ago. This, we believe, is because complaints often lead to counter-complaints with about a two month lag. This lag is approximately the time it takes NAD to process a complaint and reach a decision.

Second finding from the table is the following. As advertising expenditure increases, the number of complaints increases as well. This is a scale effect. Advertising expenditure is a measure of the economic activity in the advertising sector. The mere fact that the advertising sector is expanding naturally leads to more false advertising and, consequently, more complaints. This variable is measured annually. The regression indicates that an increase in advertising expenditure in the order of $3 billion a year is associated with an increase in complaints by more than 2. To understand the meaning of this, there are times in the period our data covers where advertising expenditure increased by $15 billion a year or more. This amounts to 10 complaints per year just due to the booming

[16]The results of the OLS regressions and linear regressions with the Prais-Winsten transformation are quite similar. Therefore, only the latter is reported in the regression table.

Table 4.4: Consumer sentiment and false advertising.

$complaints_t$	**PW (1)**	**PW (2)**	**PW (3)**
$complaints_{t-1}$	-0.043	0.028	0.009
	(0.085)	(0.085)	(0.082)
$complaints_{t-2}$	0.312***	0.288***	0.308***
	(0.085)	(0.084)	(0.082)
$complaints_{t-3}$	0.169*	0.152	0.130
	(0.097)	(0.097)	(0.093)
$adexp_t$	0.184***	0.176***	0.192***
	(0.063)	(0.062)	(0.063)
$sentiment_t$	-0.140*		
	(0.080)		
$sentiment_{t-1}$		-0.136**	
		(0.059)	
$sentiment_{t-2}$			-0.153***
			(0.055)
$time_t$	-0.400***	-0.380***	-0.412***
	(0.134)	(0.133)	(0.134)
$intercept_t$	49.995***	47.585***	51.826***
	(14.897)	(13.234)	(12.337)
No of obs	137	137	137
R^2	0.46	0.49	0.48

Note: *,**, and *** indicate a significance level of .10, .05, and .01, respectively.

advertising sector.

Third, consumer sentiment appears to have a negative effect on the number of complaints even after controlling for the amount of advertising activity, lag in the complaint process, and time trend. This empirical finding is consistence with Hypothesis 4.3.1 developed in the theory section. To have an idea of its magnitude, an increase of one standard deviation in the index of consumer sentiment is associated with an increase of nearly 2 complaints per quarter. This is a sizable amount considering the fact that the number of complaints in one quarter can range between 4 and 49. We use the current, one quarter- and two quarter-lagged sentiment index. The most statistically significant one is $sentiment_{t-2}$. This is consistent with previous studies that use the index of con-

sumer sentiment where consumers are documented to generally anticipate changes in the economic condition six months in advance of the actual change.

4.5.2 Industry-Level Analysis

In this section, we continue our analysis at the industry level. We want to test the remaining hypothesis developed in the theoretical model. More particularly, is there more false advertising in experience goods industries than in search goods industries? Also, can we find industry level variables that are related to the level of false advertising?

For this section we use industry level data from Advertising Age's datacenter. First, we match the products in the advertising complaints data with the Standard Industrial Classification (SIC) index. SIC is a United States government system for classifying industries by a four-digit code. Even though it has largely been replaced by the six-digit North American Industry Classification System (NAICS), certain government departments and agencies still use the SIC codes. Our reason for using SIC codes is that Advertising Age's industry level data is in terms of SIC codes.

Second, we create a panel of industries over the period 1997-2008 using industry level data from Advertising Age's datacenter. We are not able to use the earlier years due to unavailability of industry level data for the earlier periods. In particular, we would like to see if there is any relation between the number of advertising complaints and advertising to sales ratio (*advsales*), advertising dollars spent as a percentage of profit margin (*advmargin*), annual advertising growth rate (*advgrowth*), industrial production index (*IPI*), and market concentration (*HHI*) besides the ICS and overall advertising expenditure.

A high advertising to sales ratio may be associated with a high level of deception. If an industry is advertising-intensive, then the marginal value of advertising will be low because of the diminishing returns. Therefore, firms might choose to use deceptive advertising to increase the returns to advertising. The reason for the inclusion of advertising to profit margin ratio is similar. Advertising growth rate can tell us a story about new industries. Higher levels of advertising growth rate are expected in new industries. Then the question is, are new industries more or less likely to use deception in their advertising? The IPI data, which is available at Wharton Research Data Services, is included in the regression to control for the level of activity in the industry. This variable acts just like

the advertising expenditure variable which takes account of the scale effect, except that it is specific to the industry. If an industry is booming independent of the economic conditions, this means more advertising and naturally more deception. Finally, we include the Herfindahl-Hirschman Index to determine if there is any association between the market concentration and false advertising. Thus, the reduced form model is

$$\begin{aligned} complaints_{it} = \beta_0 + \beta_1 advsales_{it} + \beta_2 advmargin_{it} + \beta_3 advgrowth_{it} \\ + \beta_4 adexp_t + \beta_5 IPI_{it} + \beta_6 HHI_{it} + \beta_7 sentiment_{t-2} + u_{it} \end{aligned}$$

where *i* stands for the industry at the 4-digit SIC level, and *t* stands for time.

In what follows, we use Nelson's (1970, 1974) classification of goods. He distinguishes between goods with dominant *search* characteristics and those with dominant *experience* characteristics. A search good is a product or service characteristics of which can be easily determined by consumers prior to purchase, whereas the characteristics and quality of an experience good are difficult to observe in advance and ascertained upon consumption. Nelson claims that deceptive advertising will be concentrated in the advertising of experience goods. Consumers cannot verify the claims before they consume the product, hence there is room for advertisers to deceive. This would not work for search goods. Thus we should see more complaints generated for experience goods than search goods. Hypothesis 4.3.2 developed in the Theoretical Considerations section is in line with this argument.

Table 4.5: Summary statistics.

Good	**Industries**	**Observations**	**Mean**	**St dev**	**Min**	**Max**
Search	30	1420	0.09	0.36	0	4
Experience	45	2160	0.48	2.07	0	19
Durable	97	4656	0.09	0.29	0	5
Nondurable	67	3218	0.61	1.74	0	19
Durable search	11	508	0.02	0.09	0	1
Nondurable search	19	912	0.16	0.43	0	4
Durable experience	16	768	0.18	0.37	0	3
Nondurable experience	29	1392	0.78	2.48	0	13

Nelson also shows evidence of greater advertising for nondurables than for durables.

If it is true that more advertising in general brings about more deceptive advertising, then we should see more complaints for nondurables. It is clear in Table 4.5 that there are more complaints, and therefore more deceptive advertising, about nondurable goods and experience goods than about durable goods and search goods. A t-test reveals that the difference of the means is different from zero. Consequently, Hypothesis 4.3.2 is confirmed. A more careful analysis would take into account the size of the industry when comparing levels of deceptive advertising since larger industries might naturally be more complaint-intensive. However, lack of an immediate measure of industry size prevents us from controlling for it.

To remove unobserved heterogeneity caused by time invariant industry-specific components, we run series of fixed effects regressions. We do this separately for search and experience goods as classified by Nelson (1974). If we look at columns (1) and (3) in Table 4.6 first, we see that the signs of the variable *sentiment* in the two regressions are significant and opposite. The number of complaints about search goods is higher when economic times are good. On the contrary, the number of complaints about experience goods is higher when economic times are bad. For experience goods the aforementioned story holds. Firms choose a lower level of deception moving into better economic times since the cost of getting discovered is too high. In good times the cost of getting caught lying is the loss of a larger group of future customers. However for search goods there is another force in effect. Consumers are less income constrained and more time constrained, and therefore, search less during good times. This means that firms can get away with more deceptive claims. From our regression analysis, this second effect seems to be the dominant effect in search goods industries. Using valid complaints instead of the total does not change the results.

It can be seen that market concentration does not have a significant effect on the amount of deceptive advertising about search goods. Also, the significance of consumer sentiment is preserved. For experience goods, there is weak evidence that more concentrated markets are associated with lower levels of deceptive advertising. This makes sense since more intense competition might force firms to be more aggressive in their advertising behavior. When firms are in a highly competitive environment, and do not have many tools to manipulate market outcomes such as prices, they may use deceptive advertising. What is interesting is that the significance of consumer sentiment decreases in regression

Table 4.6: Product type and false advertising.

complaints	**Search (1)**	**Search (2)**	**Experience (3)**	**Experience (4)**
advsales	0.0041	0.0011	0.0126	-0.0111
	(0.0110)	(0.0173)	(0.0081)	(0.0114)
advmargin	-0.0029	-0.0018	-0.0043	-0.0032
	(0.0034)	(0.0058)	(0.0027)	(0.0047)
advgrowth	-0.0007	-0.0016	0.0084***	0.0030
	(0.0010)	(0.0021)	(0.0023)	(0.0023)
adexp	0.0007*	0.0010*	0.0028**	0.0028**
	(0.0004)	(0.0006)	(0.0011)	(0.0012)
IPI	0.0001	0.0001	0.0067***	0.0144***
	(0.0004)	(0.0005)	(0.0018)	(0.0042)
HHI		-0.0000		-0.0001**
		(0.0000)		(0.0000)
$sentiment_{-2}$	0.0048***	0.0069***	-0.0129***	-0.0068*
	(0.0012)	(0.0020)	(0.0039)	(0.0041)
intercept	-0.5374	-0.7471	0.5742	-0.6409
	(0.1879)	(0.2630)	(0.5921)	(0.6521)
No of obs	1244	735	1890	1207
No of groups	30	27	45	45
R^2 (within)	0.01	0.02	0.04	0.03

Note: *,**, and *** indicate a significance level of .10, .05, and .01, respectively.

(4). When the same regression is repeated without the *HHI* variable but using observations for which *HHI* exists, we get an insignificant consumer sentiment. This result can be driven by the fact the HHI measure only incorporates data from publicly traded companies. Privately traded companies are monitored less than publicly traded ones. Thus, the deception activities might be performed by privately traded companies more, suggesting that the significance of consumer sentiment is driven by the corresponding observations. While we conjecture these possible explanations, there is still more analysis needed to pursue the issue of concentration and its effect on deceptive advertising.

Next, we divide the industries into durable and nondurable product manufacturers following Nelson (1974) in Table 4.7. We do not find any patterns for durable goods. We

Table 4.7: Product durability and false advertising.

complaints	**Durable (1)**	**Durable (2)**	**Nondur. (3)**	**Nondur. (4)**
advsales	-0.0080	-0.0083	0.0095	-0.0069
	(0.0068)	(0.0083)	(0.0074)	(0.0102)
advmargin	0.0029	0.0029	-0.0037	0.0011
	(0.0025)	(0.0030)	(0.0023)	(0.0040)
advgrowth	0.0006	0.0007	0.0030*	0.0014
	(0.0006)	(0.0007)	(0.0018)	(0.0019)
adexp	0.0001	0.0001	0.0032***	0.0028***
	(0.0002)	(0.0002)	(0.0008)	(0.0008)
IPI	-0.0000	-0.0002	0.0062***	0.0041***
	(0.0002)	(0.0002)	(0.0009)	(0.0009)
HHI		0.0000		-0.0000
		(0.0000)		(0.0000)
$sentiment_{-2}$	0.0007	0.0008	-0.0068**	-0.0017
	(0.0006)	(0.0006)	(0.0027)	(0.0026)
intercept	-0.0239	-0.0502	-0.2387	-0.4647
	(0.0916)	(0.0895)	(0.4107)	(0.4096)
No of obs	4074	2941	2814	1916
No of groups	97	93	67	66
R^2 (within)	0.00	0.00	0.03	0.02

Note: *,**, and *** indicate a significance level of .10, .05, and .01, respectively.

find that low consumer sentiment is associated with a higher number of complaints for nondurable goods in regression (3). One intuition for the difference between durable and nondurable goods goes as follows. Durable goods are usually high-price low-frequency purchases, whereas nondurable goods are low-price high-frequency items. We have already established the fact that there is a much lower amount of deception for these goods. It appears to be the case that consumer sentiment, which is a measure of business cycle fluctuations, does not play a role in the level of deception for infrequently purchased goods. This might be because the demand for these goods is relatively inelastic. If this is the case, then it will not fluctuate much along the business cycle. The potential for increasing profits by false advertising is not there. Therefore, firms selling nondurable

goods will not change their advertising behavior as a response to changes in the economic condition. In regression (4), the significance of consumer sentiment disappears. This again might be because the *HHI* variable is picking observations for publicly traded companies leaving out privately traded ones. Alternatively, it might be the case that the measure we have constructed for market concentration is not very accurate.

Table 4.8: Product type, product durability and false advertising.

complaints	**Search & Nondur. (1)**	**Search & Nondur. (2)**	**Exper. & Nondur. (3)**	**Exper. & Nondur. (4)**
advsales	0.-0001	0.0036	0.0080	-0.0094
	(0.0145)	(0.0207)	0.0096)	(0.0179)
advmargin	-0.0028	-0.0046	0.0004	0.0027
	(0.0039)	(0.0074)	(0.0038)	(0.0085)
advgrowth	0.0004	0.0010	0.0076**	0.0028
	(0.0021)	(0.0031)	(0.0035)	(0.0035)
adexp	0.0009	0.0009	0.0027*	0.0034**
	(0.0007)	(0.0010)	(0.0016)	(0.0017)
IPI	-0.0008	-0.0009	0.0289***	0.0243***
	(0.0007)	(0.0010)	(0.0052)	(0.0067)
HHI		-0.0000		-0.0001**
		(0.0000)		(0.0000)
$sentiment_{-2}$	0.0082***	0.0105***	-0.0184***	-0.0086
	(0.0020)	(0.0028)	(0.0057)	(0.0055)
intercept	-0.7862***	-0.9386**	-0.8333	-1.2333
	(0.2935)	(0.3731)	(0.9908)	(1.0378)
No of obs	798	500	1218	814
No of groups	19	18	29	29
R^2 (within)	0.02	0.03	0.07	0.05

Note: *,**, and *** indicate a significance level of .10, .05, and .01, respectively.

As a natural next step, we analyze nondurable goods within the search and experience goods industries in Table 4.8. There are no interesting patterns for durable search and experience goods, which is consistent with our finding about durable goods as a whole. Including *HHI* in the regressions do not change the results substantially. The related

regressions are given in Appendix A.3. However, the effect of consumer sentiment on nondurable search goods is positive, and its effect on nondurable experience goods in negative. This is also consistent with our findings about all search and experience goods. It can be seen that market concentration does not have a significant effect on the amount of deceptive advertising in nondurable search goods category. Also, the significance of consumer sentiment is preserved. For nondurable experience goods, there is evidence that more concentrated markets are associated with lower levels of deceptive advertising. This finding, along with the fact that the significance of consumer sentiment disappears with the inclusion of HHI, are replications of our previous findings on all experience goods.

Finally, we run industry-level fixed effects regressions for manufacturing and non-manufacturing industries at the 4-digit SIC level. Our previous findings about the relationship between the number of complaints and advertising expenditure and IPI continue to hold for manufacturing industries. Consumer sentiment appears to be slightly significant or insignificant. This is consistent with our previous findings. We have found opposite signs for the consumer sentiment variable for search and experience goods. Therefore, the effect of consumer sentiment is wiped out when observations on these two types of goods are pooled together.

Non-manufacturing industries consist of retail, wholesale, and services. We do not see any patterns in this sector as a whole. This suggests that consumer sentiment is not associated with the amount of false advertising in non-manufacturing industries. For one thing, these industries, especially services, do not advertise at the national level. Therefore, complaints related to retail, wholesale and services do not make it to our data set. In our data set, which is at the national level, non-manufacturing industries receive much fewer advertising complaints than manufacturing. On average, manufacturing industries receive 0.26 complaints per quarter, whereas non-manufacturing industries receive 0.04 complaints per quarter. A t-test reveals that the difference of these two means is different from zero. Interested readers can find the regression table for manufacturing and non-manufacturing industries in Appendix A.3.

4.6 Conclusion

This paper attempts to establish a relationship between deceptive advertising and business cycles. Our time series and panel data analyses show a nuanced but significant negative relationship between the amount of deceptive advertising in the manufacturing sector and the macroeconomic conditions, suggesting a counter-cyclical behavior. Given the model developed in the theoretical section, this is because consumers' long-run disappointment is greater than their short-run gullibility. The theory is that when the economy is moving into a recession, firms can increase profits by advertising deceptively . This way, firms would be taking advantage of the higher demand today by making the most of it with deceptive claims. Some consumers would stop buying in the future if the firm's deceptive attempts are discovered. However, this would not hurt the firm as much since the demand would be low anyway thanks to the economic downturn.

We also explore how different product characteristics would play a role in this relationship. Our results show nuanced effect of economic conditions on deceptive practices – not all industries are affected the same way. We first show that there is significantly fewer advertising complaints about search and durable goods than about experience and nondurable goods. This implies that sellers of these goods use less deception in their advertising, consistent with the hypothesis. Buyers of search goods can more easily determine prior to purchase whether or not the advertised product characteristics are actually there. Since firms understand that this is the case, there is no incentive to advertise these goods deceptively. This finding suggests that the regulators need to put fewer resources to regulate search goods industries . It is argued that one explanation for the insignificance of the consumer sentiment variable for durable goods industries is that the demand for these goods does not fluctuate sufficiently for firms to change their advertising behavior along the business cycle.

The analysis of nondurable search and experience goods separately reveals that there is more deception in nondurable search goods industries in good economic times. We conjecture that this is because consumers search less in times of optimism, and therefore, firms can get away with more deceptive claims during these times. Overall, experience goods are counter-cyclical and search goods are pro-cyclical. What these findings suggest as a policy implication is that policy makers need to take into account macroeconomic factors in allocating resources to regulate deceptive advertising. Also, the product nature

and the type of industry should be elements in the decision process.

Finally, we touch upon the question of whether there is more or less deception in concentrated markets. We report weak evidence that more concentrated markets are associated with less deceptive advertising. It would be informative to explore in more detail the relationship between competitive pressure and deceptive advertising for future research. There is literature on whether competition leads to corruption.[17] Analyzing this possible relationship would question the neoclassical notion that competition is socially desirable because it leads to increased efficiency. Another avenue for future research would be to explore further the issue of counter-complaints. The question of interest is, whether firms strategically complain against rival firms which filed complaints against them in the past.

[17] Corruption can be defined in various ways. One study that looks at the relationship between rents, competition, and corruption is Ades and Di Tella (1999). There, the authors define corruption as bribe receiving behavior of bureaucrats with control rights over firms.

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Chapter 5

Conclusions and Further Work

The three papers presented in this dissertation focus on three different questions in the study of Industrial Organization. The first paper finds that an incumbent firm, by means of an exclusive contract, can deter entry of an equally efficient rival producing a differentiated product, and that this can increase welfare if the incumbent's and the entrant's products are close substitutes. The second paper develops a model of advertising choice where consumers are both image-conscious and snobbish, and shows how the inherent product quality, consumers' level of snobbishness, and income distribution can play roles in the firm's optimal mix of image and informative advertising. The third paper investigates the key macroeconomic drivers of deceptive advertising, and finds that deceptive advertising is counter-cyclical, and that the product nature and the type of industry should be elements to be considered in the decision process of advertising regulation.

Starting with Aghion and Bolton's (1987) seminal work, contracts has been studied as barriers to entry. Many authors have developed models under various specifications. These include, but are not limited to, contracts with liquidated damages, simultaneous and sequential contract offers, settings where a monopolist needs to sign up enough buyers so that the entrant is prevented from reaching the minimum viable scale (see Rasmusen, Ramseyer, and Wiley (1991)), settings where buyers are strategic and can contract with the entrant (see Innes and Sexton (1994)), settings where contracts happen between upstream and downstream firms (see Fumagalli and Motta (2006)).

The first paper of the dissertation contributes to this literature by studying long-term contracts in a differentiated products setting. These contracts are offered by an incumbent firm which has one period of monopoly power before the entrant appears. This way, the incumbent exploits the first-mover advantage. With the threat of not selling to the buyer in the pre-entry period if she rejects the offer, the firm convinces the buyer to sign the long-term contract. The contract is generally welfare-reducing, except when the incumbent's and the entrant's products are close substitutes. The extensions include longer-term

contracts, uncertain entry, time discounting and no commitment. One avenue to expand the literature would be to consider these contracts in a setting with downstream competition. It is not obvious if the hostage story would hold with more than one downstream firm.

The idea of image advertising stems from Veblen's (1899) well-known argument that consumption is a social activity. It is a stylized fact that some consumers find certain products less valuable if they are consumed by many. Using this observation, the second paper provides a justification for why rational consumers react to image advertising – advertising which seeks to create an image that consumers can identify with. It also looks at the firm's optimal advertising mix given these preferences, contributing to the literature on advertising choice. The hope is that the research presented in this paper provides a useful theoretical lens through which empirical analysis can be conducted.

The third paper is related to the literature on advertising regulation. It uses a unique data set on advertising complaints at the national level in the United States, and combine it with macroeconomic indicators to show that false or deceptive advertising is countercyclical. After analyzing the data further, some policy recommendations about the type of industry and prevailing economic conditions emerge. Our contribution is the use and organization of this unique data set, along with our predictions about the relationship between the amount of deceptive advertising and how well the economy is doing. Two ideas to extend the analysis done here are to explore in more detail the relationship between competitive pressure and deceptive advertising, and to explore the issue of strategic counter-complaints.

5.1 References

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Appendices

A.1 Appendix to Chapter 2

Proof of Proposition 2.3.1 and Proposition 2.3.2
The incumbent's problem is

$$\max_{\bar{p}} \quad 2\Big(\frac{a}{b}-\frac{1}{b}\bar{p}\Big)\bar{p} \quad \text{subject to} \quad \frac{(a-\bar{p})^2}{b} \geq \frac{a^2b^2}{(b+d)(2b-d)^2}$$
$$\text{and} \quad 2\Big(\frac{a}{b}-\frac{1}{b}\bar{p}\Big)\bar{p} \geq \frac{a^2}{4b}+\frac{a^2b(b-d)}{(b+d)(2b-d)^2}$$

Check first whether the constraint is binding or not. The unconstrained solution to the incumbent's problem is the monopoly price, $a/2$. Substitute $\bar{p}$ with $a/2$ in the first constraint of (3.8).

$$2\frac{(a-\bar{p})^2}{2b} \geq \frac{a^2b^2}{(b+d)(2b-d)^2}$$
$$2\frac{(a-a/2)^2}{2b} \geq \frac{a^2b^2}{(b+d)(2b-d)^2}$$
$$d^3-bd^2 \geq 0$$

This inequality does not hold for $\forall d \in (0,b]$; the monopoly price does not satisfy the first constraint. Thus, the constraint is binding. The contract price can be derived using the constraint.

$$2\frac{(a-\bar{p})^2}{2b} \geq \frac{a^2b^2}{(b+d)(2b-d)^2}$$
$$\bar{p} \leq a-\frac{ab^{3/2}}{(b+d)^{1/2}(2b-d)}$$

Next, I make sure that this price actually makes the incumbent better off than charging the monopoly price in period 1 and Bertrand price in period 2. I compare his profit with

the contract and his profit without the contract.

$$\pi^{I,WC}(d) \geq \pi_1^{I,NC}(d) + \pi_2^{I,NC}(d)$$
$$2\frac{a^2[(b^2+bd)^{1/2}(2b-d)-b^2]}{(b+d)(2b-d)^2} \geq \frac{a^2}{4b} + \frac{a^2b(b-d)}{(b+d)(2b-d)^2}$$
$$p(d) \equiv 8b(2b-d)(b^2+bd) - d^3 + 3bd^2 + 4b^2d - 16b^3 \geq 0$$

I calculate the value of the polynomial $p(d)$ at the two extreme values d can take. I get $p(0) = 0 \geq 0$ and $p(b) = (8\sqrt{2}-10)b^3 > 0$. This shows there is at least some range of d values where the incumbent makes higher profit by offering the contract. I find the values of d which satisfies $p(d) = 0$. The polynomial has no roots in the interval $(0,b)$. Thus, the incumbent always makes higher profit with the contract than without it.

□

Proof of Corollary 2.3.3
I need to show that

$$\frac{\partial \bar{p}}{\partial d} \leq 0$$

It is sufficient to differentiate the second term of $\bar{p}^*$ in Proposition 2.3.1 ignoring the fixed coefficient $ab^{3/2}$.

$$\begin{aligned}\frac{\partial}{\partial d}(b+d)^{-1/2}(2b-d)^{-1} &= -\frac{1}{2}(b+d)^{-3/2}(2b-d)^{-1} + (b+d)^{-1/2}(2b-d)^{-2} \\ &= \frac{-(2b-d)+2(b+d)}{2(b+d)^{3/2}(2b-d)^2} \\ &= \frac{3d}{2(b+d)^{3/2}(2b-d)^2} \geq 0\end{aligned}$$

Since this expression is increasing in d and there is a minus sign in front of it, $\bar{p}^*$ is decreasing in d.

□

Proof of Proposition 2.3.4

The total surplus with the contract and without the contract can be written as follows:

$$\begin{aligned}
TS^{NC}(d) &= \pi_1^{I,NC}(d) + \pi_2^{I,NC}(d) + CS_1^{NC}(d) + CS_2^{NC}(d) + \pi_2^{E,NC}(d) \\
&= \frac{a^2}{4b} + \frac{a^2 b(b-d)}{(b+d)(2b-d)^2} + \frac{a^2}{8b} + \frac{a^2 b^2}{(b+d)(2b-d)^2} + \frac{a^2 b(b-d)}{(b+d)(2b-d)^2} \\
TS^{WC}(d) &= \pi^{I,WC}(d) + CS^{WC}(d) \\
&= 2\frac{a^2[(b^2+bd)^{1/2}(2b-d) - b^2]}{(b+d)(2b-d)^2} + \frac{a^2 b^2}{(b+d)(2b-d)^2} \\
p(d) &\equiv TS^{WC}(d) - TS^{NC}(d) \geq 0
\end{aligned}$$

I calculate the value of the polynomial $p(d)$ at the two extreme values d can take. I get $p(0) = -28b^3 < 0$ and $p(b) = (16\sqrt{2} - 22)b^3 > 0$. I find the values of d which satisfies $p(d) = 0$. The polynomial has one root in the interval $(0, b)$, which is calculated to be approximately $0.93b$. Thus, offering the contract causes total surplus to increase if $d > 0.93b$.

□

Proof of Proposition 2.4.1

The total surplus with the contract and without the contract can be written as follows:

$$\begin{aligned}
TS^{NC}(d) &= \pi_1^{I,NC}(d) + \pi_2^{I,NC}(d) + \pi_1^{R,NC}(d) + \pi_2^{R,NC}(d) + CS_1^{NC}(d) \\
&\quad + CS_2^{NC}(d) + \pi_2^{E,NC}(d) \\
&= \frac{a^2}{8b} + \frac{a^2 b(b-d)}{2(b+d)(2b-d)^2} + \frac{a^2}{18b} + \frac{a^2 b^2}{2(b+d)(2b-d)^2} + \frac{a^2}{32b} \\
&\quad + \frac{a^2 b^2}{4(b+d)(2b-d)^2} + \frac{a^2 b(b-d)}{2(b+d)(2b-d)^2} \\
TS^{WC}(d) &= \pi^{I,WC}(d) + \pi^{R,WC}(d) + CS^{WC}(d) \\
&= \frac{a^2[(b^2+bd)^{1/2}(2b-d) - b^2]}{(b+d)(2b-d)^2} + \frac{a^2 b(b-d)}{2(b+d)(2b-d)^2} + \frac{a^2 b^2}{4(b+d)(2b-d)^2}
\end{aligned}$$

The rest follows from the proof of Proposition 2.3.4.

□

Proof of Proposition 2.5.1
The incumbent's problem is

$$\max_{\bar{p}} \quad 3\Big(\frac{a}{b}-\frac{1}{b}\bar{p}\Big)\bar{p} \quad \text{subject to} \quad 3\frac{(a-\bar{p})^2}{2b} \geq 2\frac{a^2b^2}{(b+d)(2b-d)^2}$$
$$\text{and} \quad 3\Big(\frac{a}{b}-\frac{1}{b}\bar{p}\Big)\bar{p} \geq \frac{a^2}{4b}+2\frac{a^2b(b-d)}{(b+d)(2b-d)^2}$$

The rest follows from the proof of Proposition 2.3.1.

□

Proof of Corollary 2.5.2
This proof follows directly from the proof of Proposition 2.5.1.

□

Proof of Proposition 2.5.3
The incumbent's problem is

$$\max_{\bar{p}} \quad 2\Big(\frac{a}{b}-\frac{1}{b}\bar{p}\Big)\bar{p} \quad \text{subject to} \quad \frac{(a-\bar{p})^2}{b} \geq \rho\frac{a^2b^2}{(b+d)(2b-d)^2}+(1-\rho)\frac{a^2}{8b}$$
$$\text{and} \quad 2\Big(\frac{a}{b}-\frac{1}{b}\bar{p}\Big)\bar{p} \geq \frac{a^2}{4b}+\rho\frac{a^2b(b-d)}{(b+d)(2b-d)^2}+(1-\rho)\frac{a^2}{4b}$$

The first constraint is nonbinding when $\rho \leq \rho^* = 1-2d^2(3b-d)/(4b^3+3bd^2-d^3)$. So the solution to $\bar{p}$ when $\rho \leq \rho^*$ is the solution to the unconstrained maximization problem: $\bar{p} = a/2$. The first constraint is binding when $\rho > \rho^*$. Then the solution is $\bar{p} = a - a[\frac{\rho b^3}{(b+d)(2b-d)^2}+\frac{1-\rho}{8}]^{1/2}$.

□

Proof of Proposition 2.5.4
The incumbent's problem is

$$\max_{\bar{p}} \quad 2\Big(\frac{a}{b}-\frac{1}{b}\bar{p}\Big)\bar{p} \quad \text{subject to} \quad (1+\delta)\frac{(a-\bar{p})^2}{2b} \geq \delta\frac{a^2b^2}{(b+d)(2b-d)^2}$$
$$\text{and} \quad (1+\delta)\Big(\frac{a}{b}-\frac{1}{b}\bar{p}\Big)\bar{p} \geq \frac{a^2}{4b}+\delta\frac{a^2b(b-d)}{(b+d)(2b-d)^2}$$

The first constraint is nonbinding when $\delta \leq \delta^* = \frac{4b^3-3bd^2+d^3}{4b^3+3bd^2-d^3}$. So the solution to $\bar{p}$ when $\delta \leq \delta^*$ is the solution to the unconstrained maximization problem: $\bar{p} = a/2$. The first constraint is binding when $\rho > \rho^*$. Then the solution is $\bar{p} = a - a\frac{b^{3/2}}{(b+d)^{1/2}(2b-d)}\sqrt{\frac{2\delta}{1+\delta}}$. □

Proof of Proposition 2.5.5
The incumbent's problem is

$$\max_{\bar{p}} \quad 2\Big(\frac{a}{b}-\frac{1}{b}\bar{p}\Big)\bar{p} \quad \text{subject to} \quad \frac{(a-\bar{p})^2}{b} \geq \frac{a^2b^2}{(b+d)(2b-d)^2}+\frac{a^2}{8b}$$
$$\text{and} \quad 2\Big(\frac{a}{b}-\frac{1}{b}\bar{p}\Big)\bar{p} \geq \frac{a^2}{4b}+\frac{a^2b(b-d)}{(b+d)(2b-d)^2}$$

The solution to this problem ignoring the second constraint is $\bar{p}^* = a - a[\frac{1}{8}+\frac{b^3}{(b+d)(2b-d)^2}]^{1/2}$ if $d \in [\tilde{d}, b]$. This is simply the minimum price that satisfies the first constraint. To see whether this solution also satisfies the second constraint I calculate the incumbent's profit with the contract.

$$\pi^{I,WC}(d) = \frac{2a^2}{b}\Big(\frac{1}{8}+\frac{b^3}{(b+d)(2b-d)^2}\Big)^{1/2}\Big[1-\Big(\frac{1}{8}+\frac{b^3}{(b+d)(2b-d)^2}\Big)^{1/2}\Big]$$

Define

$$p(d) \equiv \pi^{I,WC}(d) - \pi_1^{I,NC}(d) - \pi_2^{N,WC}(d)$$

I find the values of d which satisfy $p(d) = 0$. The polynomial has one root in the interval $(0, b)$, which is calculated to be approximately $0.11b$. Thus, offering the contract is

profitable if $d > 0.11b$.

□

Proof of Proposition 2.5.5

The total surplus with the contract and without the contract if $d > 0.11b$ can be written as follows:

$$\begin{aligned}
TS^{NC}(d) &= \pi_1^{I,NC}(d) + \pi_2^{I,NC}(d) + CS_1^{NC}(d) + CS_2^{NC}(d) + \pi_2^{E,NC}(d) \\
&= \frac{a^2}{4b} + \frac{a^2 b(b-d)}{(b+d)(2b-d)^2} + \frac{a^2}{8b} + \frac{a^2 b^2}{(b+d)(2b-d)^2} + \frac{a^2 b(b-d)}{(b+d)(2b-d)^2} \\
TS^{WC}(d) &= \pi^{I,WC}(d) + CS_1^{NC}(d) + CS_2^{NC}(d) \\
&= \frac{2a^2}{b}\left(\frac{1}{8} + \frac{b^3}{(b+d)(2b-d)^2}\right)^{1/2}\left[1 - \left(\frac{1}{8} + \frac{b^3}{(b+d)(2b-d)^2}\right)^{1/2}\right] \\
&\quad + \frac{a^2}{8b} + \frac{a^2 b^2}{(b+d)(2b-d)^2} \\
p(d) &\equiv TS^{WC}(d) - TS^{NC}(d)
\end{aligned}$$

I find the values of d which satisfies $p(d) = 0$. The polynomial has one root in the interval $(0, b)$, which is calculated to be approximately $0.79b$. Thus, offering the contract causes total surplus to increase if $d > 0.79b$.

□

A.2 Appendix to Chapter 3

Proof of Proposition 3.3.1

Differentiating the expression for $nV(p,n)$, I obtain

$$\frac{\partial nV(p,n)}{\partial p} = \frac{1}{b^2}\left(1 - \frac{\sqrt{m}}{\sqrt{m-p}}\right) < 0 \quad \forall p < m$$
$$\frac{\partial nV(p,n)}{\partial n} = 1 > 0.$$

□

Proof of Proposition 3.3.2 and Proposition 3.3.3

Solving for n from the FOC's given by (3.3) and (3.4), I obtain

$$n = f(p,m) \equiv \frac{2(m-p)\sqrt{m-p} - (2m - 3p\sqrt{m})}{b^2\sqrt{m-p}}$$
$$n = g(p,a) \equiv \frac{1}{a}p.$$

Taking the total derivatives,

$$dn = \frac{\partial f}{\partial p}dp + \frac{\partial f}{\partial m}dm$$
$$dn = \frac{\partial g}{\partial p}dp.$$

One can show that $\frac{\partial f}{\partial m} > 0$ and $\frac{\partial f}{\partial p} > 0$. Also, since $\frac{\partial g}{\partial p} > 0$, dn and dp have the same sign. When there is an interior solution, i.e. b is not too large and a is not too small, then one can show that $\frac{dn}{dm} > 0$. This also implies that $\frac{dp}{dm} > 0$. Following a similar argument, one can show that $\frac{dn}{da} < 0$ and $\frac{dp}{da} < 0$.

□

Proof of Proposition 3.3.4
Differentiating the expression for $nV(p,n)$, I obtain

$$\frac{\partial nV(p,n)}{\partial p} = \begin{cases} 0 & \text{if } p \leq b\bar{v}(1-\alpha)[2\sqrt{m} - b\bar{v}(1-\alpha)] \\ -\frac{\sqrt{m}-\sqrt{m-p}-b\bar{v}(1-\alpha)}{\alpha^2 b^2 \sqrt{m-p}} < 0 & \text{otherwise.} \end{cases}$$
$$\frac{\partial nV(p,n)}{\partial n} = 1 > 0.$$

□

Proof of Proposition 3.3.5
Solving for n from the FOC's with respect to p and n obtained from problem (3.6), I obtain

$$n = f(p,\bar{v})$$
$$n = g(p).$$

Taking total derivatives,

$$dn = \frac{\partial f}{\partial p}dp + \frac{\partial f}{\partial \bar{v}}d\bar{v}$$
$$dn = \frac{\partial g}{\partial p}dp.$$

Denote the partial derivatives as $\frac{\partial f}{\partial p} \equiv f_p$. Combining the two, I get

$$dn = \frac{g_p f_{\bar{v}} d\bar{v}}{g_p - f_p}.$$

One can show that $g_p > 0$. When there is an interior solution, i.e. when b and $\bar{v}$ are not too large, then one can show that $f_{\bar{v}} < 0$ and $g_p - f_p < 0$. This proves that when $d\bar{v}$ is positive, dn is also positive. The same is true for dp as well.

□

Proof of Proposition 3.3.6
I use the solutions for n from the proof of Proposition 3.3.5.

$$\begin{aligned} n &= f(p,\alpha) \\ n &= g(p) \end{aligned}$$

Taking total derivatives,

$$\begin{aligned} dn &= \frac{\partial f}{\partial p}dp + \frac{\partial f}{\partial \alpha}d\alpha \\ dn &= \frac{\partial g}{\partial p}dp. \end{aligned}$$

Denote the partial derivatives as $\frac{\partial f}{\partial p} \equiv f_p$. Combining the two, I get

$$dn = \frac{g_p f_\alpha d\alpha}{g_p - f_p}.$$

I want to show that the sign of dn is ambiguous when $d\alpha$ is positive. I have shown in the previous proof that $g_p > 0$ and $g_p - f_p < 0$ when b is not too large. Hence, I only need to show that the sign of f_α is indeterminate. f_α is a function of α. Let us denote it as $f_\alpha(\alpha)$. For b and $\bar{v}$ not too large or small, one can show that there is a unique $\alpha^* \in [0,1]$ which satisfies $f_\alpha(\alpha) = 0$. For $\alpha < \alpha^*$, $f_\alpha(\alpha) > 0$ and, therefore, $dn < 0$. The opposite is also true.

□

The two FOC's for problem (3.7)

$$\frac{\partial \pi_1}{\partial p_1} = \frac{n_1 p_1\left(1-\frac{\sqrt{m}}{\sqrt{m-p_1}}\right)}{(1-k)n_1+kn_2} + \frac{n_1\left((1-k)n_1+kn_2-2m+p_1+2\sqrt{m-p_1}\sqrt{m}\right)}{(1-k)n_1+kn_2} = 0$$

$$\frac{\partial \pi_1}{\partial n_1} = \frac{\left((1-k)n_1+kn_2-2m+p_1+2\sqrt{m-p_1}\sqrt{m}\right)p_1}{(1-k)n_1+kn_2} + \frac{(1-k)n_1p_1}{(1-k)n_1+kn_2}$$
$$- \frac{(1-k)n_1p_1\left((1-k)n_1+kn_2-2m+p_1+2\sqrt{m-p_1}\sqrt{m}\right)}{\left((1-k)n_1+kn_2\right)^2} - an_1 = 0$$

The two FOC's for problem (3.8)

$$\frac{\partial \pi_M}{\partial p_1} = \frac{n_1 p_1\left(1-\frac{\sqrt{m}}{\sqrt{m-p_1}}\right)}{(1-k)n_1+kn_2} + \frac{n_1\left((1-k)n_1+kn_2-2m+p_1+2\sqrt{m-p_1}\sqrt{m}\right)}{(1-k)n_1+kn_2} = 0$$

$$\frac{\partial \pi_M}{\partial n_1} = \frac{\left((1-k)n_1+kn_2-2m+p_1+2\sqrt{m-p_1}\sqrt{m}\right)p_1}{(1-k)n_1+kn_2} + \frac{(1-k)n_1p_1}{(1-k)n_1+kn_2}$$
$$- \frac{(1-k)n_1p_1\left((1-k)n_1+kn_2-2m+p_1+2\sqrt{m-p_1}\sqrt{m}\right)}{\left((1-k)n_1+kn_2\right)^2} + \frac{kn_2p_2}{(1-k)n_2+kn_1}$$
$$- \frac{kn_2p_2\left((1-k)n_2+kn_1-2m+p_2+2\sqrt{m-p_2}\sqrt{m}\right)}{\left((1-k)n_2+kn_1\right)^2} - an_1 = 0$$

A.3 Appendix to Chapter 4

Calculation of the Index of Consumer Sentiment

The following is taken from the University of Michigan Survey of Consumers' website (http://www.sca.isr.umich.edu/).

Index of Consumer Sentiment

To calculate the Index of Consumer Sentiment (ICS), first compute the relative scores (the percent giving favorable replies minus the percent giving unfavorable replies, plus 100) for each of the five index questions (see x_1,...,x_5 listed below). Round each relative score to the nearest whole number. Using the formula shown below, sum the five relative scores, divide by the 1966 base period total of 6.7558, and add 2.0 (a constant to correct for sample design changes from the 1950s).

$$ICS = \frac{x_1 + x_2 + x_3 + x_4 + x_5}{6.7558} + 2.0$$

Index of Consumer Expectations and the
Index of Current Economic Conditions

Using the same procedures given above, the Index of Current Economic Conditions (ICC) and the Index of Consumer Expectations (ICE) are calculated as follows.

$$ICC = \frac{x_1 + x_5}{2.6424} + 2.0, \qquad ICE = \frac{x_2 + x_3 + x_4}{4.1134} + 2.0$$

Index Questions

The Index of Consumer Sentiment (ICS) is derived from the following five questions:

x_1 = "We are interested in how people are getting along financially these days. Would you say that you (and your family living there) are better off or worse off financially than you were a year ago?"

x_2 = "Now looking ahead–do you think that a year from now you (and your family living there) will be better off financially, or worse off, or just about the same as now?"

x_3 = “Now turning to business conditions in the country as a whole–do you think that during the next twelve months we’ll have good times financially, or bad times, or what?”

x_4 = “Looking ahead, which would you say is more likely–that in the country as a whole we’ll have continuous good times during the next five years or so, or that we will have periods of widespread unemployment or depression, or what?”

x_5 = “About the big things people buy for their homes–such as furniture, a refrigerator, stove, television, and things like that. Generally speaking, do you think now is a good or bad time for people to buy major household items?”

List of Selected Search and Experience Goods

Table A.1: Search and experience goods with SIC codes.

Search Goods	**SIC**	**Experience Goods**	**SIC**
Durable		**Durable**	
Household furniture	2510	Books	2731
Glass products	3220	Tires	3011
Pottery & related products	3260	Cutlery, handtools, gen hrdwr	3420
Jewelry	3911	Household appliances	3630
Dolls & stuffed toys	3942	Household audio & video eq.	3651
Games	3944	Radio, TV broadcast, comm. eq.	3663
		Motor vehicles	3711
		Photographic eq.	3861
		Watches, clocks & parts	3873
		Sporting & athletic goods	3949
Nondurable		**Nondurable**	
Knitting mills products	2250	Food and kindred products	2000
Carpets & rugs	2273	Beverages	2080
Apparel & other finished products	2300	Tobacco products	2100
Paper & allied products	2600	Newspapers	2711
Rubber & plastic footwear	3021	Periodicals	2721
Leather & leather products	3100	Pharmaceutical preps	2834
		Soap, detergent, toilet preps	2840

Note: The list is a modified version of Table 1 as found in Nelson (1974).

Regression Results for Durable Search and Experience Goods

Table A.2: Product type, product durability and false advertising.

complaints	**Search & Durable (1)**	**Search & Durable (2)**	**Exper. & Durable (3)**	**Exper. & Durable (4)**
advsales	0.0128	0.0078	-0.0205*	-0.0214
	(0.0101)	(0.0059)	(0.0105)	(0.0140)
advmargin	-0.0046	-0.0035	0.0052	0.0053
	(0.0034)	(0.0026)	(0.0038)	(0.0047)
advgrowth	-0.0003	-0.0017	0.0015	0.0018
	(0.0005)	(0.0018)	(0.0013)	(0.0017)
adexp	-0.0005	0.0002	0.0003	0.0012
	(0.0004)	(0.0003)	(0.0007)	(0.0008)
IPI	0.0019	0.0001	-0.0010	0.0033
	(0.0014)	(0.0005)	(0.0007)	(0.0028)
HHI		-0.0000		-0.0000
		(0.0000)		(0.0000)
$sentiment_{-2}$	-0.0004	0.0004	0.0020	0.0061**
	(0.0006)	(0.0004)	(0.0018)	(0.0030)
intercept	-0.0416	-0.0592	-0.0433	-0.3792
	(0.0973)	(0.1032)	(0.2751)	(0.3790)
No of obs	446	235	672	393
No of groups	11	9	16	16
R^2 (within)	0.01	0.02	0.01	0.07

Note: *,**, and *** indicate a significance level of .10, .05, and .01, respectively.

Regression Results for Manufacturing and Non-Manufacturing Sectors

Table A.3: Industry conditions and false advertising.

complaints	**Manuf (1)**	**Manuf (2)**	**Non-manuf (3)**
advsales	0.0048	-0.0101	0.0002
	(0.0060)	(0.0074)	(0.0010)
advmargin	-0.0026	0.0024	-0.0002
	(0.0019)	(0.0026)	(0.0002)
advgrowth	0.0027***	0.0017**	-0.0000
	(0.0008)	(0.0008)	(0.0003)
adexp	0.0011***	0.0010***	0.0002
	(0.0003)	(0.0003)	(0.0001)
IPI	0.0013***	0.0005**	
	(0.0003)	(0.0003)	
HHI		0.0000	
		(0.0000)	
$sentiment_{-2}$	-0.0020*	0.0003	0.0002
	(0.0012)	(0.0011)	(0.0004)
intercept	0.0410	-0.1198	-0.0219
	(0.1718)	(0.1648)	(0.0633)
No of obs	6972	4934	5796
No of groups	166	161	138
R^2 (within)	0.01	0.00	0.00

Note: *,**, and *** indicate a significance level of .10, .05, and .01, respectively.