

**"THE EFFECT OF ADVERTISING ON  
PRICE AND QUALITY: AN EMPIRICAL STUDY  
OF EYE EXAMINATIONS, SWEET LEMONS  
AND SELF-DECEIVERS"**

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# THE EFFECT OF ADVERTISING ON PRICE AND QUALITY: AN EMPIRICAL STUDY OF EYE EXAMINATIONS, SWEET LEMONS AND SELF-DECEIVERS

## Abstract

Theoretical research on the economics of information has long debated whether advertising competition increases market efficiencies (fostering high quality, low-priced products) or leads to market failure (fostering low-quality, higher-priced rip-offs). This debate, and subsequent empirical studies, has had an impact on policy making and the deregulation of advertising and marketing activities, especially for professional service industries. In this paper we provide empirical evidence which suggests that, under certain conditions, information asymmetry can lead to low-quality advertising firms competing against, and gaining market shares from, high-quality nonadvertising firms. Such a "lemons" process might also occur with advertising firms ultimately charging higher prices (adjusted for quality) than nonadvertisers. Our test involves analyses of data collected from an industry which has experienced various forms of marketing/advertising deregulation over the past two decades: optometric services. Our findings give empirical support to theories that information asymmetry, coupled with advertising and product bundling strategies, can lead to market failure. Such an outcome is argued to be most foreseeable in markets where self-deceiving consumers believe they can judge product quality, but cannot, and end up being satisfied with low quality products at high quality-adjusted prices -- "sweet lemons".

**Key Words:** Advertising and Quality, Quality and Price, Lemons, Optometry, Professional Services.

## I. INTRODUCTION

Theoretical research has long debated whether advertising competition increases market efficiencies (fostering high quality, low-priced products) or leads to market failure (fostering low-quality, higher-priced rip-offs). This debate has had an impact on policy making and the deregulation of advertising and marketing activities. Industries which have recently been deregulated in the United States include the medical and legal professions; such professions are still highly regulated in virtually all other countries. Government prohibitions on advertising and other forms of marketing practice are often designed to remedy possible market failure associated with consumer inability to objectively judge product quality. Marketing or advertising deregulation is advocated as a means to lower entry barriers, increase competition, and lower market prices.

In this paper we present an empirical test of economic theories which hypothesize that advertising can lead to market inefficiencies. In particular, we examine an industry which exhibits information asymmetry between consumers and sellers: optometric services. We test, for those services exhibiting high levels of credence qualities, eye examinations, (1) if advertising is negatively correlated with quality, and (2) if low-quality sellers who advertise can increase market shares at the expense of high-quality sellers who do not advertise, and (3) if low-quality advertising firms can charge higher quality-adjusted prices (or product markups) than nonadvertising high-quality firms. Recognition of such a possibility can radically change the expected outcome of governmental policies designed to encourage marketing activities. In fact, this study, coupled with recent research in marketing, suggests that certain policies designed to protect consumers from low-quality producers (e.g. licensing, branding) may in fact accelerate and not prevent the decline in the quality of products offered to consumers.

Following a discussion of current theories and the proposed hypothesis in Section II, Section III presents empirical research on optometric services. Contrary to previous predictions in the literature, eye examination quality offered by optometrists is shown to have declined while prices have, possibly, increased following a period of advertising deregulation. Section IV discusses plausible explanations for the apparent divergence between our findings and predictions made by previous empirical research. In doing so, we consider an extreme, yet plausible, form of information asymmetry where "illusory qualities" (in contrast to search, experience, or credence qualities) act as irrelevant quality signals used by "self-deceivers", who systematically purchase low-quality products, or "sweet lemons", at high prices.

## II. REVIEW OF CURRENT THEORIES

The economics and marketing literature suggests that the effects of advertising on prices and quality are a function of the extent of information asymmetry on quality, the form of advertising/marketing activities, and the role of countervailing institutions which stand to prevent market failure. Various forms of "quality" have been considered in the literature (e.g. "objective quality", "subjective quality", "verifiable quality" or "actual quality"); see Zeithaml (1988) for a review of related literature. It is useful to think of information asymmetry in terms of the difference between quality as perceived by firms ( $Q_f$ ) and that perceived by consumers ( $Q_c$ ). These perceived qualities have been modelled as functions of the product's attributes, general background information/knowledge (e.g. levels of expertise), and, in the case of consumers, firms' marketing activities; for the most part, the theoretical literature has considered products to have a single attribute on which quality is judged. The fact that consumers are not fully aware/informed of  $Q_f$ , or its functional form, indicates some level of information asymmetry. In general, the quality of concern to regulators and the literature is  $Q_f$ , or some surrogate of  $Q_f$  which can be estimated by a third or independent entity (e.g. consumer magazines).

The literature examines the impact of asymmetry by considering three types of product qualities. Nelson (1970, 1974, 1978) examines the role of advertising for products with "search" and "experience" qualities which can be accurately assessed prior to (during shopping trips) or after consumption (use experience), respectively. Darby and Karni (1973) consider a third type of product having "credence" qualities which are difficult to assess prior to or even during use. The literature suggests that the role of advertising and countervailing institutions varies depending on the type of qualities encountered.

In the case of search goods, Nelson argues that firms will not misrepresent their own perceptions of quality ( $Q_f$ ) in advertisements since consumers will ultimately discover  $Q_f$ , forcing the appropriate price adjustment. Similarly, Klein and Leffler (1981) and Milgrom and Roberts (1986), among others, show that repeat purchase behavior associated with experience goods would also discourage false claims in advertising. Nelson contends that, in such cases, firms selling high-quality products ( $Q_f$ , price adjusted) have the most to gain from advertising, whereas low-quality sellers will in the long run be required to adjust price or quality to competitive levels. Advertisements for experience goods are likely to be "informative" by providing consumers accurate information on price, product existence, retail outlets, product quality and value vis-à-vis low-quality competitive substitutes. Tirole (1989, p. 115) notes, however, that products which supposedly have high levels of experience qualities are often advertised heavily using noninformative media/messages and provide no information beyond existence. For experience products, empirical studies have either shown a positive relationship between quality and

advertising (Archibald, Haulman and Moody, 1983; Federal Trade Commission, 1953; Lambin, 1976; Marguardt and McGann, 1975; Tellis and Fornell, 1988) or are inconclusive (Cole et al., 1955; Farris and Buzzel, 1979; Rotfeld and Rotzoll, 1976). Schmalensee (1978) theoretically shows, however, that low-quality producers may advertise more heavily than high-quality sellers depending on their unit cost advantage and consumers' response function to advertising. The literature does not provide empirical evidence supporting Schmalensee's theory, however, of a strong negative correlation between advertising and quality ( $Q_f$ ).

The case for advertising regulation is strongest when products are dominated by credence qualities (Darby and Karni). Akerlof (1970) shows that, when there is extreme information asymmetry between consumers and sellers, markets of high-quality products will ultimately disappear when low quality products are introduced. This outcome is labelled the "lemons" process after the market for used automobiles. Comanor and Wilson (1967, 1974, 1979), among others, strongly argue that, in such cases, advertising by low-quality producers will be noninformative and serves to reduce cross-price elasticities of demand. In theory, noninformative advertising can compensate for low-quality, allowing low-quality sellers to charge equal or higher prices than high-quality nonadvertisers. The lemons process can consist of low-price, high-quality products being replaced by high-priced, heavily advertised, low-quality products. While empirical studies have shown a positive relationship between advertising and price elasticities (see, for example, Krishnamurthi and Raj, 1985), there is no empirical evidence demonstrating situations where price is positively correlated to advertising by low-quality producers, or that a lemons process has occurred in markets with information asymmetry (see, for example, Bond 1982, who tests the lemons hypothesis on the market for used trucks).

Akerlof claims that a number of countervailing institutions may prevent market failure. Formal (non-market-driven) countervailing institutions which prevent low-quality sellers who advertise from capturing market shares from high-quality non-advertisers (who offer services at the same or lower prices) can include licensing and minimum-quality standards (Leland 1979; Besanko et al. 1988), mandatory disclosure rules (Matthews and Postlewaite 1985), and formal or self-imposed bans on advertising. Informal market-driven institutions might include warranties and guarantees (Cooper and Ross, 1985; Kubo, 1986; Emons, 1988), branding (Ross, 1988), consumer magazines, or consumers seeking second opinions; highly publicized product/service failure may also prevent the lemons process from occurring for products with high credence qualities. In many cases, market failure is avoided when a certain proportion of the population is sufficiently informed on product quality ( $Q_f$ ). In such cases, Wolinsky (1983) shows, for example, that price will act as an accurate signal of or will be correlated with quality ( $Q_f$ ); the greater the asymmetry, however, the higher the profits associated with lower quality ( $Q_f$ ). Also, Darby and Karni contend that consumers will recognize that products may be heavily endowed with credence qualities, and are likely to be skeptical of product claims, therefore reducing the impact of advertising; Ford, Smith

and Swasy (1990) find, however, that consumers are no more skeptical of such advertisements than for search or experience goods.

All products have, given heterogeneity in consumers' perceptions, differing levels of search, experience and credence qualities. The justification of regulations restricting advertising is often debated (for a particular product) based on two empirical issues: (1) are the products/services in question dominated by search, experience or, especially, credence qualities, and (2) can market-driven countervailing institutions, including industry self-regulation, prevent the lemons outcome without government intervention or formal self-regulation?

### The Hypotheses

The theories of Schmalensee and Comanor and Wilson which suggest that advertising can lead to what Tellis and Fornell (1988) call "perverse" equilibria have not been supported in the empirical literature. Empirical tests have not focused, however, on products which are heavily endowed with credence qualities (e.g. services) since measures of quality are often difficult to estimate. In this paper we test the following hypotheses suggested in the theoretical literature for products exhibiting high levels of credence qualities:

- (H1) advertising will be negatively correlated with quality ( $Q_f$ );
- (H2) low-quality ( $Q_{f1}$ ) heavily-advertised products will drive high-quality ( $Q_{f2}$ ), unadvertised products from the market
- (H3) A. prices, adjusted for quality ( $Q_f$ ), will be positively correlated with advertising.  
B. if both advertisers and nonadvertisers face similar cost structures, or if low-quality firms have a cost advantage (per unit measure of  $Q_f$ ), profits margins (markups or gross margins) of low-quality firms will be higher than high-quality firms.

While distinguishing between two types of firms, the third hypothesis asks the question: can low-quality firms, called "dishonest" by Tellis and Wernerfelt, sell products at higher or equal prices (adjusted for quality) to those offered by "honest" firms (or profits, assuming similar input costs)?

The hypothesis implies the transition of a given market across three time periods:

- first, when only honest firms exist in the market,
- second, when honest firms compete with dishonest firms,
- third, when only dishonest firms remain.

During each period, consumers have assessments of each firm's quality:  $Q_{c1}$  for the dishonest firm, and  $Q_{c2}$  for the honest firm. Consistent with the literature reviewed above, however, our test is based on quality as perceived by firms, independent organizations, or regulators ( $Q_f$ ). The hypotheses (I, II, and III) have yet to be empirically supported in the literature.

### III. AN EMPIRICAL STUDY OF EYE EXAMINATIONS

As noted above, regulation is most easily justified for products having high levels of credence qualities. Zeithaml (1981) and Bloom and Reve (1989) note that certain products are heavily endowed with credence qualities, especially services (e.g. auto repair, legal, dental and medical services). In studying the optometric industry, we will assume that eye examinations provided by optometrists exhibit high levels of credence qualities. In support of this assumption, Ehrlich et al. (1961) and Lebow (1974) find that consumers systematically judge the quality of medical care ( $Q_c$ ) as being higher than care ( $Q_f$ ) actually received (as judged by independent expert reviewers). Such asymmetry has long been recognized in the economics literature for medical procedures (see Arrow, 1963, and Pauly, 1978), and has been documented for optometric services by Rosenthal (1980) who finds that consumers are unable to accurately judge  $Q_f$  after experiencing a medical eye examination.<sup>1</sup>

#### Empirical Approach

To test the hypotheses, this paper examines data collected over critical periods of history concerning the price and quality of eye examinations provided by optometrists. The ability to measure price and certain critical aspects of eye examination quality as perceived by firms ( $Q_f$ ), the existence of brand names, chain firms, licensing, minimum quality standards, and, presumably, information asymmetry makes this industry desirable for empirical tests of the impact of advertising on market equilibria. Empirical studies have focused on the impact of advertising optometrists (who often practice in or are employed by chain firms) on market prices and quality of eye examinations. A number of these studies, relying on data collected in 1977 or earlier, have made two strong conclusions:

- (C1) restrictions existing to prohibit the growth of optometric chain firms (or advertisers) increase market prices for eye examinations (adjusted and unadjusted for quality differences), and
- (C2) eye examination quality ( $Q_f$ ) will not decline if chain firms and other advertisers are allowed to compete (enter the market) against nonadvertisers: the lemons process will not take place.<sup>2</sup>

These conclusions are in line with other empirical research cited in the literature review which fail to show the lemons process for other products. These studies have prompted the United States Federal Trade Commission (FTC) to advocate the elimination of advertising and nonadvertising

commercial restrictions (e.g., the use of brand names) in markets where they exist. With respect to eye examination quality, the FTC (Bond et al. 1980) has concluded that the economies associated with high-volume operations which advertise should generate price declines without an erosion of eye examination quality. In a review of empirical literature on optometric and other health care professions, Gaumer (1984) notes, however, that existing studies investigate the impact of incremental changes in regulatory practices without considering information from unregulated environments where advertising is permitted without restriction. In the case of eye examinations, the empirical studies cited above rely on data gathered prior to the impact of the mid-1977 U.S. Supreme Court decision (the "Bates Decision") which found restrictions on advertising by professionals unconstitutional.<sup>3</sup> Before the Bates Decision, optometric advertising was mostly limited to local areas; a bold-print listing in the Yellow Pages was sufficient for the FTC to classify an optometrist as an advertiser in 1977.

The next sections of this paper investigate quality and quality-adjusted price for both eye examinations and eyewear. The primary focus here, as in regulatory proceedings and in the literature, is on the quality of eye examinations as perceived by optometrists and regulators,  $Q_f$ , since examinations are endowed with credence quality are regulated via minimum standards, are provided by licensed doctors, and are the service provided by optical establishments for which public health is supposedly at risk if quality declines. Less focus is given to eyewear since quality has been shown to be equivalent across low- and high-volume practices; both advertising and nonadvertising optometrists may sell the same national brands and/or use the same grinding laboratories (see Bond et al.); the dispensing of eyewear, unlike examinations, is generally not regulated and can be performed by nonphysicians (including opticians). Issues related to convenience of service and other service attributes, not considered in regulatory proceedings or the empirical literature, will be discussed later in the paper. Our working assumption is that the form of information asymmetry suggested in the hypothesis (credence qualities) exists for eye examinations, as suggested in the studies of by Rosenthal and others, cited earlier. Even if such asymmetry does not exist, this analysis will at a minimum shed light on whether the predictions of previous empirical research on the quality and price of eye examinations, with respect to the impact of advertising deregulation, have been realized.

### **The U.S. Optometric Industry: Background**

Since 1977 the optometric industry has undergone significant regulatory and commercial changes. Prior to 1977, forty States restricted the use of price or nonprice advertising by optometrists (Mackintosh and Frey 1978). Moreover, since the early 1900s, "commercial" restrictions have existed to varying degrees on the use of trade/brand names, location in retail malls, employment of optometrists by nonoptometrists, use of branch offices, and use of franchise agreements (Mauziri et al., 1981). In mid-1977 the Supreme Court's landmark Bates decision found price and nonprice

advertising restrictions unconstitutional but left intact the myriad of state-level commercial restrictions. Despite commercial restrictions, chain retail optical firms have grown dramatically since 1977 and are now found in all states and major cities (Cahill et al., 1985; Haas-Wilson 1986). In 1982, there were 3,500 optical chain firm outlets and 16,000 private optometric offices; in 1987 there were 6,000 chain firm outlets and 450 "superoptical" chain firm outlets versus 15,000 private optometric offices (Bennett 1988)<sup>4</sup>. Superoptical chain firms, not present before 1977, have substantially higher volumes than traditional chain firms. The number of superoptical outlets grew from less than 25 in 1983 to 100 in 1985, 300 in 1986 and 450 in 1987 (Stone, 1984; Odenbach, 1986; Bennett, 1988). Bennett (1988, p. 2) reports that the increase in the number of chain firm outlets in 1987 was "negated by the closing of a similar number of smaller private offices."

The growth of chain firm outlets has been accompanied by increases in marketing activities including local/national advertising campaigns whose costs are spread over a large number of outlets with the same brand name. Following annual double-digit growth rates in the post-Bates period, industry advertising reached \$150 million in 1987. In 1977 virtually all advertising expenditures were dedicated to print media, especially to Yellow Pages display advertisements (Harris, 1978; Stone, 1985; Bennett, 1987). In 1987 Yellow Pages were still the media of choice across all types of practitioners but television network advertisements represented some 50 percent of total advertising expenditures, incurred mainly by large chain retail optical firms (Bennett, 1988). Also in 1987, Precision Lens Crafters, the leading superoptical (231 outlets) spent 32 percent of total industry television advertising versus 23 percent for Pearle Vision Centers, the leading traditional chain firm (700 outlets; Bennett, 1988). This concentration of marketing expenditures corresponds, in 1987, to superopticals capturing some 27 percent of the market controlled by optical chain firms while having less than 7 percent of chain outlets (Bennett, 1988). The percentage of optometrists who advertise has increased from 26 percent in 1981 to 46.3 percent in 1986 and 73 percent in 1988 (20/20, December 1981, p. 27; Bennett, 1987; Bennett, 1988). These percentages contrast with a 1976 pre-Bates survey indicating that only 8 percent of optometrists favoured the use of advertising by optometrists (Guerrein, 1976).

Reflecting the freedom to advertise and the apparent circumvention of state commercial restrictions designed to curb their growth, noted by Kwoka (1985), is the increase of chain firms' share of the optical industry. In 1976 chain firms employed 8.6 percent of optometrists and garnered 33.3 percent of optometric industry sales (Bennett, 1987). These shares have gradually grown to 18.9 percent of employment and 53.7 percent of sales, respectively, in 1987 (Bennett, 1988).<sup>5</sup> Private optometrists' shares therefore declined to 81.1 percent of employment and 46.3 percent of sales, respectively. In 1986, 50 percent of ophthalmologists (M.D.s), 44 percent of chain firm optometrists (O.D.s) and 33 percent of independent optometrists indicated that the larger chain firms had "irrevocably destroyed private practitioners" (Odenbach, 1986). These post-Bates share changes

are consistent with pre-Bates conclusions drawn by Benham (1972), who evaluated 1963 eye examination and eyeglass market shares across states having no advertising restrictions and those having some form of restriction. Benham finds that firms/clinics ("likely to represent larger commercial firms") had up to 76 percent share in areas where advertising was not restricted and as little as 7.7 percent share where advertising was prohibited (the latter percentage being a better reflection of the employment shares of chain firms in restrictive markets).<sup>6</sup>

In addition to the growth of commercial optometry, the 1980s witnessed an increase of chain-firm ownership by companies/corporations having broader marketing skills, yet not traditionally associated with optometry, including Grand Metropolitan Hotels of Great Britain (Pearl Vision Centers), Quaker Oats (Eyelab), Gillette (EyeWorld, Eye + Tech), U.S. Shoe (Lens Crafters), Sears (Eye Care Centers of America), and various regional/national drug store chains. Advocates of this increasing concentration and commercial expansion in optometry claim that advertisers/chain firms lower market prices by passing on economies of scale typical of nonoptometric high-volume retail chain operations (Haffner 1982), and offer more convenient services. Restrictions on marketing activities can be seen as reflecting a strategy of nonadvertisers to increase the costs of entry and operation for advertisers (see, for example, Oster 1982; and Salop and Scheffman 1983). Opponents of these commercial practices feel that high volume optometric firms (advertisers and chain firms) provide lower (inadequate) eye examination quality to consumers in spite of licensing and minimum examination requirements (Bowman 1982). In the presence of information asymmetry, retail marketeers are seen as having objectives incompatible with providing adequate eye care or meeting minimum requirements.

### Quality of Eye Examinations

Prior to the impact of the 1977 Bates decision, the Bureau of Economics of the FTC undertook the most extensive survey to date on the price and quality of optometric services across markets with varying degrees of advertising and chain firm existence. Nineteen subjects with different, but "relatively routine optometric needs" were trained to record basic aspects of eye examinations. Optometrists visited by the subjects can be classified as belonging to two cells (pre-Bates environments) depending on the existence of chain firms (see Table 1 for a for the design of the FTC study). In Cell 1, optometrists are classified as nonadvertisers (NONADV1) or in-store-only (window display) advertisers (STORE1). In markets where both advertising and chain firms were present, optometrists are classified as nonadvertisers (NONADV2), in-store-only advertisers (STORE2), small-firm advertisers not associated with national chains (ADVERT), and optometrists associated with large national chain firms (CHAIN); the variable POOL signifies the pooling of observations from ADVERT and CHAIN which reflects all "commercial" optometrists.<sup>7</sup> In 1977, a bold-faced listing in the Yellow Pages or a newspaper advertisement was a sufficient condition to be

classified as an advertiser (ADVERT or CHAIN) by the FTC.

Optometric eye examination quality ( $Q_f$ ) has been traditionally measured in the literature as the length of, or the number of components in, the examination (see Footnote 2). Objective standards, accepted by chain/advertising optometrists, nonadvertising optometrists, and State Regulatory Boards require that optometrists provide a number of well defined medical procedures during a basic eye examination. In order to provide adequate medical diagnostics and to meet State regulations, a basic eye examination should include case history checks (age, family eye history, personal eye history and symptoms), an eye health examination (external visual examination, eye movements, cover tests, pupil reactions to light, biomicroscope--split lamp, ophthalmoscopy, tonometry--glaucoma test, visual field screening and tests), vision tests (initial visual acuity, color vision test, depth perception test, distant binocular tests--phorias at distance and ductions at distance, near binocular tests--phorias and ductions), and refraction error tests (retinoscopy, subject refraction, binocular balance, amplitude of accommodation, and near point convergence tests). Inadequate "quicky" examinations usually focus on subject refraction, which is a minimal procedure used for the prescription of lenses, and do not include eye health procedures, case histories or vision tests; refraction usually involves equipment which rotates various corrective lenses through which patients gauge improvements in vision. Irrespective of the use of assistants or special equipment, both advertising and nonadvertising optometrists agree that a basic examination (i.e., not including minor adjustments to previous prescriptions) should last twenty minutes or more if medically adequate (or State mandated) procedures are undertaken. A prescription based solely on patient refraction may initially improve visual acuity but will not affect an undetected underlying cause such as advanced disease, diabetes, high blood pressure, or tumors (conditions optometrists should detect with basic procedures and may refer to specialists). The failure to identify underlying causes of visual problems can have dramatic consequences on patient health, the deterioration of which is not easily traced to an incomplete eye examination. Irrespective of the examination technology used or the reliance on assistants for certain procedures, under no circumstances can an examination last less than 15 minutes and be medically adequate or meet State legal requirements.<sup>8</sup>

Table 1 reports the cell means of eye examination lengths (TIME) for practitioners in 1977 as collected by the FTC subjects who underwent an extensive training program in Colleges of Optometry. The lengths of examinations reported have been found to be highly correlated with the number and type of procedures used in the eye examination, which were also recorded by the subjects (lower examination lengths reflect the nonperformance of required/basic procedures, FTC, Bond et al.). The means in Table 1 and the OLS regressions, which adjust for subjects' eye conditions (myopia, and binocularity) using dummy variables, reported in Table 2 indicate that examinations given by nonadvertising optometrists' in Cell 1 lasted some 26 minutes; significantly higher ( $\alpha < .01$ ) than small firm advertisers (17 minutes) and chain firms (16 minutes) in

nonrestrictive markets (Cell 2); see Model 1, Table 2. Within Cell 2, nonadvertisers (NONADV2) perform significantly longer ( $\alpha < .01$ ) examinations (29 minutes) than in-store advertisers (STORE2), small-firm advertisers (ADVERT), and chain advertisers (CHAIN); see Model 2, Table 2.

The treatment of time as a continuous measure, however, may not reflect whether optometrists meet their own minimum quality standards. The dependent variables  $\text{TIME} \geq 15$  and  $\text{TIME} \geq 20$  are dummy variables which indicate whether sample examinations lasted 15 minutes or more and 20 minutes or more, respectively. Using the more conservative indicator of 15 minutes or more, Table 1, indicates that approximately 41 to 47 percent of large chain firms and small-firm advertisers provide inadequate, or "illegal" examinations, compared with 8 and 13 percent for nonadvertisers in nonrestrictive (Cell 2) and restrictive (Cell 1) markets, respectively. The more liberal measure of adequacy (20 minutes) yields a similar relationship with chains and advertisers providing inadequate examinations between 66 and 67 percent of visits, and nonadvertisers providing from 22 to 33 percent inadequate examinations. Logit models reported in Table 2 (Models 3, 4, 5 and 6) indicate that the difference between nonadvertisers in Cells 1 and 2 are significantly higher than both small media advertisers and large chain firms ( $\alpha < .01$ ).<sup>9</sup> Quality differences among nonadvertisers are not significant across Cells 1 and 2 (Models 3 and 5, Table 2), while the limited sample of in-store advertisers prevents statistical conclusions. As above, where quality is measured as TIME, this analysis indicates that the introduction of chain firms can only erode average market quality ( $Q_f$ ) by increasing the number of illegal or medically inadequate eye examinations as defined by both advertising and nonadvertising optometrists themselves. If we conservatively assume that advertisers and chain firms garner a 50 percent share in markets where they exist, the percentage of inadequate examinations ( $Q_f = \text{TIME} < 15$ ) had grown from 13 percent in regulated environments to 26 percent in unregulated environments (pre-Bates).

The empirical conclusion that advertisers and chain firms in pre-Bates markets provide lower quality of care has been found in earlier analyses of the FTC data (Bond et al.; Kwoka). Earlier analyses have concluded, however, that the introduction of chain firms does not reduce the quality of care given in the market. The erosion of overall market quality is completely dependent on weighting schemes employed which may not foresee long-term shifts in optometric employment. Either low-quality optometrists gravitate to an advertising mode, to compensate for their quality, or advertisers are able to compete without providing high-quality eye care (perhaps by offering a different mix of services, discussed below).

To conclude that quality of care has declined, we must determine whether post-Bates chains which now use national television advertising and have higher employment and market shares have not improved their quality since 1977. In a post-Bates study conducted in 1985, 11 trained subjects

having common, yet non-routine, eye conditions were sent to chain and private practitioners in the boroughs of New York City; New York City was chosen due to the high concentration of both chain and private practitioners allowing samples sizes larger than the FTC study (Cahill et al., 1985). A list of the subjects' eye conditions is given in Table 3. The subjects were not informed of the purpose of the examinations, but were trained to record two key elements: (1) the extent to which the optometrist asked about the subjects' medical history; and (2) examination length (in minutes) including time spent with assistants. All optometrists were classified as "private" or "chain" by directory listings. Random samples were drawn from each population frame. Table 4 shows the percentage of optometrists asking for medical histories by group.<sup>10</sup> The t-statistic of 2.7 being significant at  $\alpha < .01$  level suggests that "process" quality of chain firms is lower than that of private practices, corroborating the FTC data. On average, chain firm examinations lasted less than 14 minutes; private practice examinations lasted 31 minutes, the difference being statistically significant at  $\alpha < .01$  level (the t statistic equals 4.21). Table 4 also shows the proportion of eye conditions correctly diagnosed. Unlike previous studies relying on the FTC data which indicated no difference in prescription accuracy ("outcome" quality) across practitioners (Bond et al. 1980, 1983), these data indicate that chain firm optometrists were less able to detect eye conditions than private practitioners (t-statistic equals 2.88 significant at .01 level). The use of subjects with nonroutine conditions (versus using subjects with simple myopia or similarly routine conditions, as in the FTC study) can explain this result. The lack of diagnosis may also lend support to those in favour of market intervention in the form of minimum quality standards and explain why examinations lasting less than 15 minutes cannot meet current standards. For pre-Bates markets, the evidence clearly supports the first part of the hypothesis with respect to products exhibiting high levels of credence qualities, as foreseen by Comanor and Wilson:

H1. Quality ( $Q_f$ ) is negatively correlated with advertising; the firms which advertise the heaviest, provide lower levels of care ( $Q_f$ ).

The lack of price (or informative) advertising for eye examinations in unrestrictive markets (Cell 2) reinforces this result, as shown in Table 1; advertising for credence goods are likely to be noninformative (Comanor and Wilson).

Given the lack of improvement in examination quality during the 1980s, and the increasing shares of chain firms, the second part of the hypothesis is supported in contrast to conclusion C1 previously predicted:

H2: low-quality ( $Q_f$ ) advertisers are displacing high-quality ( $Q_f$ ) nonadvertisers.

The first two hypotheses are supported, irrespective of whether the advertising optometrist works

for a chain firm or not. It should be noted that a vast majority of optometrists now advertise (using the pre-Bates FTC definition); if all such advertisers (which may not be associated with chain firms) provide the level of care estimated from the FTC data for ADVERT, then the erosion of quality is greater than that implied by the consideration of only large chain firms (CHAIN). Again, and as in the previous literature, quality refers to eye examinations ( $Q_f$ ) only. Other services which advertisers or chain firms may bundle with eye examinations, such as convenient shopping locations, are taken up later.

The lower eye examination quality levels can be attributed in part to the higher volumes of chain firm optometrists; one representative of a leading national chain firm noted that his firm's optometrists' see more patients in one year than a private optometrist sees in three years.<sup>11</sup> In addition to the higher throughput per optometrist, and the nonenforcement of State requirements, several factors can explain the inherently low eye examination quality provided by advertisers and optical chain firms. Public testimony presented before the FTC reveals that some advertisers provide bonuses to their optometrists based on the number of patients seen. For many advertisers, patients are seen on a "first-come first-served" walk-in basis (without appointment). Thus, during busy hours of the day optometrists have incentives to give quicker examinations so that customers forming a queue do not leave due to lengthy waiting. Some optical chains openly advertise their speed in filling eyewear prescriptions. Holding to such claims may also induce shorter examinations, as service and product are often bundled. In addition, chain firms are also employers of newly licensed optometrists who have little or no clinical experience (Bennett 1988, see also footnote 9). Some argue that these new hires are moulded to accept quicker examinations though they are trained in the latest techniques. Finally, advertising-induced volume increases (assuming a positive elasticity) per employed optometrist will decrease quality to the extent that volume increases cannot be perfectly matched with the quantity of professional labor supplied.

### Unbundled Examination Prices Adjusted For Quality

The FTC data indicate that pre-Bates chain firms and advertisers charged some \$10 less per examination (unbundled with eyewear) than nonadvertisers in Cell 2 and about \$5 less than nonadvertisers in Cell 1; pre-Bates transaction prices were correlated with quality.<sup>12</sup> To test the third hypothesis, we can consider examination time divided by price as a measure of quality-adjusted ( $Q_f$ ) price: a per minute billing rate offered to patients (given that quality, price, and level of advertising are endogenous). The advantage of this approach is that it provides a proxy measure of mark-ups (profits) within markets and across competitors, assuming a competitive labor market. The use of PRICE/TIME as a dependent measure also assumes that the two are determined jointly by optometrists.

Cell means for PRICE/TIME are reported in Table 5. The regressions reported in Table 2 (Models 7, 8, and 9) show that labor prices of chain firms are significantly higher than those of nonadvertising optometrists – this higher "real" price is a direct indication of the lemons process at work, especially when considering that some 50 percent of advertisers' examinations are medically inadequate. If one were to consider paying for an examination not meeting minimum state requirements as a total loss, as one might consider money spent on a broken toy, then the economic prices charged by advertisers and chain firms are even higher. Examination of the underlying cell means reported in Table 5 indicates that within restrictive markets, advertisers and chain firms charge more per minute than nonadvertisers; the regressions confirm that these differences are statistically significant ( $\alpha < .01$ , or  $\alpha < .10$  depending on the model). Table 2, Model 7, indicates that prices, adjusted for quality, are not statistically different across nonadvertisers in restrictive (Cell 1) and nonrestrictive markets (Cell 2). Although pre-Bates chain firms may have offered lower transaction prices than non-chain optometrists, they charged higher prices per minute for their services.

Thomas (1983) finds a similar relationship with respect to post-Bates optometrists in a survey limited to the city of Atlanta, Georgia. He finds that nonchain optometrists provide examinations which are 118 percent longer in length (40.25 minutes) than chain firms (18.5 minutes) which confirms that post-Bates chains provide lower quality than nonchains. Thomas also finds that chain firms charge 48.8 percent more per examination minute (\$1.89) than nonchain firms (\$1.27).

### Unbundled Eyewear Prices

The economic benefit of advertising and chain firm practices is their supposed ability to pass on economies of scale to consumers, via lower prices, based on volume purchases of testing equipment and eyewear (contact lens, frames, and so on). Some 20 to 30 percent of dispensing optometrists' revenues (excluding superopticals) are generated from eye examinations and vision therapy, while the remaining percentage is generated from eyewear (Odenbach 1979, Stone 1983). Products are often bundled with examinations, making comparisons of "total package" prices difficult (the prices investigated thus far were not bundled with eyewear purchases). Pre-Bates advertisers' "low" examination retail prices (unadjusted for quality) may reflect a bundling strategy to increase eyewear sales; or conversely, low eyewear prices may be bundled to extract greater surplus on eye examinations. To examine this possibility, Table 5 reports eyeglass frame prices, adjusted for each brand, and sample sizes. These data, which are part of the FTC study, were collected in separate visits by trained subjects who purchased both examinations and eyeglasses (where eyeglasses were itemized separately); Table 6 summarizes the brands collected in the survey. Prices which adjust for brand differences can be calculated by dividing the itemized retail prices by national wholesale list prices; such prices are likely to underestimate mark-ups for chain firms or large volume

practices which may receive discounts on national wholesale listings due to bulk purchases distributed across multiple nonchain outlets (though individual optometrists can obtain discounts via association membership and cooperative buying; Bennett, 1988, p. 8). With the exception of Seattle, advertisers' eyeglass frame prices appear to be equal to or greater than nonadvertisers, though sample sizes are limited (see Table 5). Table 2, Models 11, 12, and 13, reports that prices (FRAMES) charged by advertisers (pooling across small-firm advertisers (ADVERT) and chains (CHAIN) to increase sample size, labelled POOL) are significantly higher ( $\alpha < .01$ ) than for nonadvertisers in restrictive markets (Cell 2) and marginally higher ( $\alpha = .04$ ) than nonadvertisers in restricted markets (Cell 1). Clearly, the data do not support the belief that advertisers pass-on economies of scale, in the form of lower eyewear prices. Given the prices received per minute of professional time, the same can be concluded for economies which might be associated with eye examinations.

### **Bundled Examination and Eyewear Prices**

Given that chain firms and small-firm advertisers apparently charged more for eyewear and quality-adjusted examinations during the pre-Bates era, it is surprising that the FTC (Bond et al.) found that chain firms charged less than non-advertisers for examinations bundled with frames; this conclusion seems apparent from the examination of cell means given in Table 5, and the regression Models 14 and 15 in Table 2 for "BUNDLE" which measures the prices paid by the survey subjects for examinations bundled with eyewear. The data, at face value, indicate that chains charged less for the bundles than nonchains. Previous studies of the FTC data, however, do not explicitly consider two basic facts: (1) the frame brands collected by the survey subjects were not identical across optometrists, and (2) the examination lengths across practitioners were not of equal quality ( $Q_f$ ) or length. If we subtract the wholesale price of the frames from the total price, we obtain an estimate of the bundle's price, adjusted for the frame quality differences (BUNDLE1). Table 2, Models 16 and 17, shows that this adjustment results in large chains not charging less than nonadvertisers in either Cells 1 or 2; small chains have frame-adjusted prices which are less than nonadvertisers in Cell 2. These regressions ignore the differences which remain concerning the quality of eye examinations. If we divide BUNDLE1 by the length of examination, we obtain a rough estimate of the real price each practice charges per minute of professional's time, including the eyewear dispensing margin when both examination and frames are bundled (BUNDLE2). Regression Models 18 and 19 in Table 2 clearly indicate that, adjusted for both examination and eyewear quality, both large chains and small advertisers charge substantially higher prices than nonadvertisers in either Cell 1 or Cell 2. In fact, based on Model 18 in Table 2, one might conclude that nonadvertisers charge higher prices in deregulated markets than nonadvertisers in regulated market ( $\alpha < .01$ ); high quality service may be more expensive in unregulated markets than in regulated markets.

In contrast to conclusion C2 suggested in the literature cited above, the pre-Bates evidence available tends to support the third research hypothesis and the model proposed by Tellis and Wernerfelt (1987) who find that price will be negatively correlated with quality when the level of information asymmetry is sufficiently high:

(H3) A. prices, adjusted for quality ( $Q_f$ ), are positively correlated with advertising.

B. if both advertisers and nonadvertisers face similar cost structures, or if low-quality firms have a cost advantage (per unit measure of  $Q_f$ ), profits margins (markups or gross margins) of low-quality firms are higher than high-quality firms.

Part B of the hypothesis is supported if one assumes that chain firm optometrists have similar input costs or benefit from some form of economies of scale, as claimed by advocates of commercial optometry.

#### **A Review of Post-Bates Industry Studies**

The pre-Bates (1977) evidence clearly indicates that large volume chain firms and advertisers do not pass on economies of scale to consumers; such optometrists offer lower quality of eye care, while charging higher prices per minute of service, both unbundled and bundled with eyewear; eyewear prices, adjusted for quality differences, are higher for chain firms and advertisers than nonadvertisers. Chain firms charged lower eye examination prices unadjusted for quality, perhaps as a strategy to attract customers to purchase high margin eyeglasses (a bundling strategy). This strategy was used prior to the existence of national television advertising campaigns. Industry surveys conducted after the advertising deregulation (the 1977 Bates Decision) reveal that high volume practices and chain firms may be now charging higher prices, unadjusted for quality, for eye examinations than nonadvertisers. By 1981 "group incorporations", which had higher patient volumes, charged 10 percent more than "solo" practitioners for eye examinations and between 1 percent and 6 percent more for eyewear (Gregg 1981). In an empirical study of price dispersion limited to California, Wardlaw (1982) reports that the lowest eyewear prices are not offered by chain optical firms. In addition to finding that chain firms charge higher prices per minute of examination time, Thomas (1983) finds that retail mark-ups over published wholesale list prices of national chains are not statistically different from those of nonchain advertisers and nonadvertising private optometrists (without considering possible volume discounts). By 1984, "high volume" practices (with over \$200,000 in sales) were charging some 7 percent more for eye examinations and eye wear than "low volume" practices having less than \$200,000 in sales (Stones, 1984). Stone finds, based on a nationwide sample of 1000 optometrists, that mark-ups of high volume providers are 17.6 percent higher for ophthalmic frames, 29.6 percent higher for spectacle lenses, 30.4

percent higher for contact lenses and solutions, 39.4 percent higher for accessories, and 27 percent higher for plano-sunglasses than those of small volume practices.<sup>13</sup> Stone's results are self-reported and may reflect to some extent large-volume operation mark-ups over possibly discounted wholesale prices. By 1986 examination fees, **not adjusted for quality**) charged by chain firms were 14 percent higher than nonchain/independent practitioners; chains charged 27 percent more than independents for eye examinations bundled with frames and lenses, and 6 percent more for eye examinations bundled with contact lenses (Odenbach, 1986). Bennett (1988) also reports that chains charge higher prices for eyewear products than private optometrists. In 1987, the 7.6 percent growth in industry gross revenues was due "primarily to the strong increase in prices charged at all levels and not to any substantial increase in the amount of product sold"; prices charged by private optometrists were lower than those of most chains for eyewear products, though in-store chain optometrists were found to charge less for examinations (not bundled with eyewear) than private optometrists (Bennett, 1988, pp. 2, 8). Overall, higher priced superoptical chain firms "allowed other players in the market to remain in business; many would not survive a down price marketplace" (Bennett, 1988, p. 6).

An especially striking possibility not formally hypothesized or tested is that mass media advertisers may now be charging higher transaction prices for eye examinations than nonchain firms in post-Bates markets without apparent improvements in eye examination quality, leading to the following proposition for heavily advertised (e.g. television) products with credence qualities (in contrast to hypothesis H3):

- (P4) A. with the introduction of television advertising, prices, unadjusted for quality ( $Q_f$ ), are positively correlated with advertising while advertising is negatively correlated with quality;
- B. low-quality advertisers can charge higher prices (unadjusted for quality) at higher profits (gross margins or mark-ups) than high-quality nonadvertisers.
- C. High-priced (unadjusted for quality), low-quality ( $Q_f$ ) advertisers will gain market shares from low-priced, high-quality nonadvertisers.

While further empirical research is warranted to formally test this proposition (a lemons process at higher prices), the pre-Bates conclusions presented and the post-Bates trends reported in industry studies clearly stand in direct contradiction of the conclusions (C1 and C2) made in previous studies of the eye examination prices and quality.

#### IV. DISCUSSION

Two plausible explanations can be offered to explain the difference between our results and those foreseen in previous empirical literature on eye examination quality and prices: (1) information asymmetry (i.e.  $Q_f$  differing from  $Q_c$ ), or high credence qualities, allow the lemons process to take place as hypothesized, (2) the higher prices paid by consumers is consistent with them receiving higher levels of perceived quality ( $Q_c$ ) not associated with either the examination, the eyewear, or the two bundled. Consumers may be consciously trading off lower examination quality ( $Q_f$ ) or higher prices for increased levels of other bundled services not considered in the economic literature or by regulators (convenient location, friendly service etc.).

##### Information Asymmetry, Self-Deceivers, and Sweet Lemons

To explore these alternative explanations we can consider the form of asymmetry present for optometric services, and, empirically, estimate the likely shopping habits of consumers who are "fully informed" of  $Q_f$ , and current market shares. In a comparison of untrained consumer (patient) judgements of quality, with those of licensed (peer) optometrists, Rosenthal (1980) report that only 2 percent of patients feel unable to judge eye examination quality. Opinions formed by the remaining 98 percent of untrained consumers are statistically independent of those formed by peer optometrists.<sup>14</sup> Both groups judged the quality ( $Q_f$ ) of subjects' eye examinations as unsatisfactory for (1) failure to refer ocular pathology properly; (2) prescribing eyeglasses which do not adequately correct visual acuity or visual function; (3) not prescribing eyeglasses which could significantly improve vision; or (4) prescribing unnecessary eyeglasses. During public hearings before the U.S. Federal Trade Commission, one optometrist, representing retail chain-firm optometric practices, noted the use of office decoration (the "high tech" room) by consumers as an irrelevant signal of quality:<sup>15</sup>

They [the patients] are taken back outside [to the lobby from the "high tech room"], and a doctor calls them. A lot of the time the patients say, "oh, there is more?" They think they are done, have had a thorough exam. And they haven't even been seen by a doctor.

Apparently, some patients believe they have had a thorough examination even before a refraction is performed and before they are examined with an ophthalmoscope.

The study by Rosenthal reveals a rather extreme form of information asymmetry where, despite an apparently low levels of search and experience qualities, untrained consumers feel qualified to make expert judgements, though incorrectly, on the medical quality of care ( $Q_f$ ). Such unrecognized credence or pseudo experience or search qualities, here labelled "illusory" qualities,

can be defined as qualities ( $Q_f$ ) that consumers honestly believe they can make correct judgements on (from the firm's point of view), but, in reality, cannot or do so incorrectly vis-a-vis firms' judgements. Darby and Karni (1973) contend that consumers will be skeptical of advertisements for products with high credence qualities ~~because these qualities can be recognized~~. Illusory qualities, in contrast to "simple credence" qualities, are perceptions relied upon for overall quality judgements ( $Q_c$ ) most by "self-deceivers" (Taylor 1989), or those who do not recognize information asymmetry or do not understand/know their incorrect valuations of quality ( $Q_f$ ).

The marketing literature has long recognized the use of signals/cues by consumers when information is incomplete, or costly to gather on product quality (Zeithaml 1988). Zeithaml (1984) notes, for example, that certain services are often intangible, nonstandardizable, and rarely carry enforceable guarantees or warranties. She finds that professional service providers can successfully manipulate cues as a part of their marketing strategies when actual service quality (or some part of service quality) cannot be evaluated by consumers (e.g. improving the appearance of facilities, creating brand names, raising prices, using testimonial and quality-oriented advertising). In a review of the empirical literature, Pinson (1986) cites numerous studies on cues used by consumers for complex products including advertising, prices, packaging and labelling, brand names, logos, "made in" labels, or product noise (e.g. the sound of a car door closing signalling engine performance, or a pen cap click being used to judge durability). In addition to product specific cues, broader environmental factors or halos (e.g. pastel-colored offices) surrounding the complex product in question have been shown to influence judgements of quality (see, for example, Beckwith and Lehmann 1975; Hutchinson 1983, Holbrook 1983; and Dillon et al. 1984). Such consumer behavior can explain, in part, the finding of Urban and Hauser (1980) that marketing strategies for products such as deodorants, antacids, hand-care lotions, beer, health care services, education services, banking services and transportation (airline) services often focus on "psychological dimensions" of consumer perceptions (as opposed to tangible product attributes).

Illusory cues, therefore, are those consumers systematically use and incorrectly correlate with the target quality of concern ( $Q_f$ ). In situations where such quality cues are used, quality perceived by consumers ( $Q_c$ ) is a function of  $n$  attributes associated with the product ( $A_{ci}$ ,  $i=1, \dots, n$ ), as well as general background information/knowledge ( $K_c$ ) available to the consumer:

$$(1) \quad Q_c = g_c(a_{c1}, \dots, a_{cn}, A_{c1}, \dots, A_{cn}, K_c),$$

where

$A_{ci}$  = the perceived level of attribute  $A_i$ , and  $a_{ci}$  = the weight given to attribute  $A_i$  in the formation of overall quality assessment.

Likewise, for firms (assuming all firms have similar perceptions), perceived quality is given as

$$(2) \quad Q_f = g_f(a_{f1}, \dots, a_{fn}, A_{f1}, \dots, A_{fn}, K_f)$$

where

$A_{fi}$  = the perceived level of attribute  $A_i$ ,

$a_{fi}$  = the weight given to attribute  $A_i$  in the formation of overall quality assessment;

$K_f$  = the knowledge available to the firm.

At any moment,  $Q_f$  need not equal  $Q_c$ : the general knowledge available, the perceived attribute levels, the weights given to each attribute, or even the functional forms of  $g(\cdot)$  may not be the same across firms and consumers;  $a_i$  or  $A_i$  may be functions of knowledge. For example, marketing activities, and the use of cues by consumers might imply that attribute weights, levels, and knowledge can be a function of firms' marketing policies, and knowledge transferred from other consumers (e.g. word-of-mouth).

The difference in perceived attribute levels, weights and general knowledge reflects the extent of information asymmetry between the seller and the consumer. In fact, information asymmetry may still exist when  $Q_f$  equals  $Q_c$ , since the functions  $g_c(\cdot)$  and  $g_f(\cdot)$  may not be identical; consumers can rank the quality of various products as firms would, but for different reasons. In the case of optometric services, illusory qualities or unrecognized credence qualities may exist because self-deceiving consumers incorrectly believe that accurate judgements can be made with respect to the levels and functional form of  $g_f(\cdot)$  after searching (shopping) across firms or experiencing (using) firms' products.

To illustrate such situations, consider a defendant in a case who believes his lawyer is incompetent and decides to never use him/her again in the future. The lawyer, however, gave the best possible defence, despite a guilty verdict. Had the defendant been given the same amount of knowledge about law as the lawyer prior to the trial, would he have the same post trial opinion? If yes, then the degree of information asymmetry has little affect on the future relationship between the lawyer and the defendant (the defendant probably will not use the lawyer again); no lemons process will take place. If no and the defendant would have a different opinion of the lawyer, then the self-deception leads to a competent lawyer losing business to some other lawyer. The illusory quality, in this case, is associated with experience qualities (e.g. the outcome of the trial); the defendant is putting, say, a high weight on the attribute "outcome"; a weight the defendant would see as incorrect provided the defendant would know  $K_f$ , or  $g_f(\cdot)$ . Advocates of marketing/advertising regulation are concerned with the opposite case: low quality firms which rely on advertising being judged as providing an equal or higher level of quality than high-quality firms which do not use advertising; the former firms capture market shares from the latter, hence the lemons process.

It must be stressed that neither the lawyer nor the defendant in our example have a "correct" or "objective" measure of quality; the two parties simply have different assessments (hence asymmetry). The core question is whether consumers would change their behavior if they were given, or are revealed, "full information", which is defined as  $g_f(\cdot)$  for all firms. We assume that the both high-quality and low-quality firms have the same appreciation of quality (which is the case for eye examination quality in optometry) and if  $g_f(\cdot)$  is revealed to consumers, the difference of qualities perceived by firms will be understood by the consumer who was unable to know the "illusion" prior to, or after product purchase. The form of information asymmetry documented for optometric services follows very closely with previous definitions of asymmetry for products with high levels of credence qualities, with the exception that consumers feel they understand  $g_f(\cdot)$  for all firms, but, in fact, do not, or are making incorrect correlations (as viewed by firms) between signals/cues and certain aspects of quality (search, experience, or other).

A novel implication of such asymmetry is the possibility that after the honest firms have been driven from the market, consumer's perceptions of quality,  $Q_C$ , may be equal to or even higher than the situation where honest firms were the only players, due to marketing activities, and cue utilization. This can occur since the information asymmetry may never be corrected due to self-deception: since quality is multi-attribute, the "uninformed" assessment of  $Q_{C1}$  can be inflated for the dishonest firms (i.e.  $Q_{C1} > Q_{C2}$ ). Advertising firms can bundle additional products/services (e.g. a "high tech room") which may incorrectly signal quality ( $Q_f$ ) for certain products in the bundle; overall quality assessments may be higher for items in the bundle, than for these items had they not been bundled.

### **The Impact of "Full Information"**

The evidence collected does not directly test whether consumers are knowingly trading off low-quality eye examinations ( $Q_f$ ) for higher levels of bundled services ( $Q_C$ ). The literature's focus on eye examination quality as a single attribute product may explain, however, the divergence between pre-Bates predictions and post-Bates outcomes for the optometric industry. The higher prices (adjusted or unadjusted for quality) charged by post-Bates chain firms may reflect higher aggregate utility levels for consumers who see optometric practices as offering a multi-attribute service: eye examinations, rapid eyewear dispensing, location in convenient retail malls, pleasant offices, and cheery personnel. While measuring such qualities ( $Q_f$  and  $Q_C$ ) can prove difficult, empirical studies of consumer preferences have shown that consumers actually value examination quality and the professional integrity of the optometrist more than "location convenience" and "acceptable fees" (Koetting and Craig Andrews, 1979).<sup>17</sup> Furthermore, the gain in shares by chain firms has resulted in a drop of optometric outlets per capita (implying a lower level of one form of convenience quality). Cahill et al. surveyed the SMSAs studied by the FTC and found (in the post-

Bates era) that markets having greater restrictions on chain firms have a greater percentage of outlets advertising weekend and evening opening hours; chain firm competition may not lead to greater levels of convenience competition.

Despite the lack of empirical evidence that post-Bates chain firms offer higher levels of convenience-type qualities than pre-Bates practices, the FTC survey can be used to test whether the purchase decisions of chain-firm patrons would change if they were fully informed (i.e. if they are revealed optometrists' measures of examination quality)? Full information is assumed to affect consumer assessments of attribute quality; it may also affect the weight consumers give to each criteria in formulating an overall quality judgement. The FTC collected information on their trained subjects' overall "subjective" opinions of the optometric establishments surveyed in 1977 using the following battery of questions (labels in Table 7 in parentheses):

- (1) Was an adequate case history taken (HISTORY)?
- (2) Was an adequate eye health exam performed (EXAM)?
- (3) Were adequate vision tests made (VISION)?
- (4) Was care properly diagnosed and managed (DIAGNOSIS)?
- (5) Was the OD willing to spend time to examine thoroughly & explain his/her findings (THOROUGH)?
- (6) Do you have confidence in the overall competency of the OD (COMPETENT)?
- (7) Would you send a family member or friend to the OD for:  
an eye health examination (SENDEXAM)?
- (8) Would you send a family member or friend to the OD for:  
vision testing for an RX (SENDRX)?
- (9) Would you send a family member or friend to the OD for:  
a more complicated vision problem (SENDCOMPLEX)?

Logit models reported in Table 7 indicate that, for these subjective measures, small-firm advertisers and chain firms offer lower levels of "fully informed yet subjective" care than nonadvertisers in both Cells 1 and 2. The aggregate of the responses can be used as a benchmark against long-run equilibrium shares generated by untrained consumers. For example, subjects answered "yes" to Question (7), SENDEXAM, in 52.1 percent ( $n = 140$ ) of the cases for nonchain practices and 15.9 percent ( $n = 63$ ) for chain firms. As the logit models estimated in Table 7 indicate, these "subjective" quality differences are significant at  $\alpha < .01$ . Assuming that trained subjects are not self-deceived (are fully informed) and that affirmative answers can be translated into purchase outcomes (all attributes being considered), chain firms and small-firm advertisers would garner 23.4 percent in markets with full information, while nonadvertisers would garner 76.6 percent.<sup>18</sup> As noted above, 73 percent of optometrists advertised in 1988 and chain firms

alone had 53.7 percent of industry sales in 1987. All attributes being considered, the difference between the hypothetical and actual shares cited demonstrates the extent to which this industry may be suffering from a "sweet" lemons process (i.e. quality declines with higher prices and possibly, at higher levels of uninformed consumer satisfaction).

## V. INTERPRETATION AND CONCLUSIONS

Our study of the optometric industry generally supports the hypotheses suggested by the theoretical literature on products with credence qualities: (1) low quality firms advertise the most, (2) low quality advertisers displace high-quality nonadvertisers, (3) in spite of economies of scale typically associated with large volume or chain operations, low quality firms need not have lower margins, or charge lower prices to compete (adjusted or unadjusted for quality).<sup>19</sup> For the optometric industry, the post-Bates equilibrium appears to consist in a growing proportion of optometrists becoming advertisers (73 percent in 1987), with the larger volume suppliers not necessarily charging lower prices than low-volume practitioners. The 27 percent of optometrists who chose not to advertise in 1987 had seen their form of practice gradually decline in market share and employment levels over the previous decade. If one accepts pre-Bates definitions of quality ( $Q_f$ ) used by the economics literature and regulators, the negative correlation between quality and advertising (e.g., advertisers offer the lowest quality), coupled with the price trends reported earlier, the evidence would suggest gradual market failure, which accelerated after the introduction of national advertising in 1977. In the post-Bates era, the evidence presented tends to support a lemons process: low-quality advertisers do not charge lower prices/mark-ups (both adjusted and unadjusted for quality) while increasing employment and market shares vis-à-vis high-quality optometrists.

Consistent with this outcome, Rizzo and Zeckhauser (1990, pp. 497-8) find in an empirical study of physicians that "the FTC's strong interventions in favour of physician advertising may have promoted entry and competition in the short run, while established physicians remained hesitant to advertise. Eventually, however, through the aging of the population and the breakdown of norms, physicians falling into this group will begin to advertise... more established physicians will gain at the expense of their less established peers. Competition will be diminished." Why have market-driven countervailing institutions failed to prevent the decline of high quality eye examinations, or maintain high levels of competition? Akerlof specifically cites three institutions which arise to counteract the effects of quality uncertainty: brand names, commercial chains which advertise, and licensing. All three institutions currently exist in the optometric industry. In the remainder of this paper, we will discuss why illusory qualities and self-deception, coupled with informed marketing techniques, may interact with these institutions to reinforce or even accelerate the lemons process, not prevent it. The form of information asymmetry considered can be

characterized by situations where sellers have complete information on quality, sellers understand that consumers cannot make accurate judgement on quality (pre- or post-purchase), consumers are self-deceivers, and sellers are aware of this deception. Market failure may be occurring, using Akerlof's terminology, in a market of "sweet" lemons where illusory qualities dominate the decision rules of self-deceivers.

### **Branding and Chain Firms**

The economic value of a chain firm is, in part, based on economies of scale generated by the use of advertising, brand names, and product standardization. Can brand names accurately signal quality ( $Q_f$ )? In markets for nonstandardizable services with illusory qualities, the answer is probably no. The economic value of a trade name based on advertising is likely to fail in accurately signalling quality in the optometric profession because consumers cannot distinguish between an adequate eye examination and one that is incomplete (e.g. one that fails to detect dormant conditions). Two optometric trade names can be of equal value based on repeat purchase reputation while the quality of care delivered by them is divergent. Table 7 illustrates one television news survey with respect to eyewear across national and local chain firms. Though anecdotal, the survey reveals that, among chain firms, even the quality of eyewear can vary substantially from one establishment to another, with the larger more established chains not necessarily providing the better products. Since consumers are accustomed to brand names signalling standardized or guaranteed quality (Klein and Leffler 1981; Rao and Monroe 1989), we infrequently observe brand advertising designed to signal "illegal" or "inadequate" quality. Optical chain firms may therefore take advantage of prior brand signalling in product categories unrelated to optical goods and services (Wheatley and Chiu 1977). For example, when customers enter retail optical chains they invariably see nationally branded/distributed eyeglass frames, as well as branded accessories which are also found in nonchain locations. The existence of these in-store displays may act as irrelevant eye examination quality signals. This general carry-over effect is accentuated when optical chains open offices in nonoptical retail establishments, as is the case in Sears department stores. Post-Bates chain firms in particular have circumvented state commercial restrictions on location, employment and trade names by using, for example, "side-by-side" arrangements whereby examinations are given in an office immediately adjacent to the opticians' shop where prescriptions are filled. The two entities appear physically as one or are represented as one in the Yellow Pages or television advertisements, but are in fact separated by a partition/wall. Though created and managed by the same corporate entity, the two side-by-side operations may have separate legal entities. Such arrangements are designed to use the brand equity of an opticians' (dispensing) operation to signal the same level of quality for the optometrists' examinations next door. An optician's facilities may offer a higher perceived quality of certain dispensing services (choice of frames, grinding in "about an hour" etc.), but cannot guarantee a

standardized, or high quality of eye examination care provided by the optometrist next door. The joint use of the same brand names may act, therefore, as an irrelevant signal when unstandardized services (examinations) are bundled with standardizable products (eyeglass frames, mall location). Such arguments have been used to justify legal restrictions on the use of trade/brand names. Waldman (1981) cites three Supreme Court findings with respect to optometric trade names being uncorrelated to quality and/or competitive prices: (a) the reputation of the firm may be based on individuals no longer employed; (b) a firm may assume a new name if the former name becomes associated with negligent practice; and (c) the same firm using several brand names gives a false impression of competition among shops under common ownership.

### **Brand Advertising**

The inherent complexity of eye examinations, the negative correlation between advertising and examination quality, and possible consumer self-deception in judging quality would suggest that advertising and other marketing activities will be noninformative by not reducing information asymmetry. In the 1977 FTC survey, using bold faced print in the Yellow Pages was a sufficient condition to be classified as an advertising optometrist. In pre-Bates SMSAs having chain firms, only "nonprice" advertising was detected for eye examinations and "price" advertising for eyewear (advertising in newspapers and telephone directories). By the mid-1980s, some chain firms had expanded to the national level, allowing substantial economies to television advertising and brand name usage. Pearl Vision Centers, the largest chain firm in 1985, began televised campaigns with the ambiguous theme, "Nobody cares for eyes more than Pearl." Some chains' advertisements, via patient testimonials, emphasize consumer satisfaction with the "speed" of service, thus defining quality as being compatible with high volume operations. In markets with high illusory qualities, firms need not misrepresent quality via deceptive/false advertisements; advertising may act as a quality signal leading consumers to fool themselves into believing incorrect correlations between attribute levels, or weights, and quality. The existence of advertising, and not deceptive advertising, can lead to quality signals (Kirmani and Wright 1989). The use of non-informative national television advertising in optometry is consistent with Comanar and Wilson's finding that in markets with high degrees of credence qualities, advertising will likely not be fully informative (e.g. telling consumers that advertisers' examinations generally fall below minimum standards that their own doctors agree upon).

### **Licensing**

Many chain firm advertisements stress that eye examinations are provided by licensed optometrists. The term "licensed" implies that medically adequate care should be equally produced at chain and nonchain locations. Because enforcement of standards are lacking or are too costly,

the term "license" can act as an irrelevant signal. Ziethaml notes that services are, by definition, nonstandardizable; cues suggesting standardization are irrelevant to such services, but may be used nevertheless.

### **Concluding Remarks**

The impact of extreme information asymmetry suggests renewed theoretical research in light of apparent public policy and institutional failure in the optometric industry in guaranteeing a medically adequate level of eye examination quality. Given the possible systematic use of irrelevant cues, certain countervailing institutions such as branding and licensing may contribute, therefore, to the illusion that quality of care is not declining. Consumers, because they are self-deceived, may be less likely to lobby for countervailing institutions, or effectively use them if they are present. Murray (1991) finds, for example, that consumers will not seek information on quality if they perceive risks to be low. Central to the model of sweet lemons is the assumption that consumers are unable to judge pre- and post-purchase quality due to product complexity and self-deception. The use of product signals, or cues, such as advertising and other marketing activities may stand to reinforce the sweet lemons process, especially if the inference on quality is systematically incorrect (e.g. the "high tech" room being used as a signal for a complete eye examination). In fact, low-quality producers (chain firms) have found it more profitable to increase prices which may incorrectly signal higher examination quality (Lichtenstein and Burtin 1989).

The theory of sweet lemons does not lead to clear policy statements (as opposed to regulations on deceptive advertising), nor does this study provide evidence that pre-Bates advertising regulations are optimal. For example, one extreme policy might be to eliminate the requirement that optometrists have academic degrees above high school. Under such circumstances, information asymmetry is reduced between seller and consumer; buyers at least will know that his/her purchase is nothing more than a simple refraction which is not likely to detect conditions more complicated than myopia. Some optical firms have allowed customers to select their own prescriptions based on them sampling various pairs of glasses; permitting such practices certainly reduces asymmetry, but may not guarantee eye health care quality (e.g. incidences of detecting preventable illness). Further consideration of alternative institutions or policies designed to reduce information asymmetries (as opposed to increasing entry barriers) clearly warrant further consideration. Finally, the multi-attribute nature of products, which may lead to the bundling of nonstandardizable and standardizable products and services, would also suggest continued empirical research on the influence of consumer perception (or illusion) and information asymmetry on purchase behavior within this and similar industries.

## *FOOTNOTES*

1. In a study it sponsored, the FTC (Bond et al. 1980) notes that the low explained variance in their analysis may be consistent with the view that "consumer misinformation" among other factors, plays a role in optometric markets. Using the FTC data, Kwoka (1984, p. 215) also warns that residual imperfections in consumer information, in addition to unmeasured quality differences, may explain cross-practitioner quality constant price differences.
2. Pre-1977 studies include Benham (1972), Benham and Benham (1975), Bond et al. (1980, 1983), Feldman and Begun (1978, 1980, 1985), Begun and Feldman (1981), Begun (1979), Kwoka (1984), and Hass-Wilson (1986). See also the FTC proceedings for Trade Regulation Rule on Ophthalmic Advertising (known as Eyeglasses I) and FTC Ophthalmic Practice Rules -- proposed Trade Regulation Rule (Eyeglasses II).
3. *Bates v. State Bar of Arizona*, 1977, 433 U.S.A.
4. In 1987, superopticals typically had 4,500 square feet of retail space and grossed \$1.4 million per outlet versus \$275 thousand per outlet for typical chain firms having some 1,100 square feet of retail space (Bennett 1988; Stone 1984). Private (nonchain) optometrists' offices, though larger in square footage than traditional chain firms at some 1400 square feet, grossed on average \$188 thousand per year in 1987 (Stone 1984; Bennett 1988).
5. Share estimates are net of optometrists employed by the military, veterans hospitals, and health maintenance organizations.
6. Benham's shares, which incorporate examinations and eyeglasses sold by ophthalmologists, translate to 52 percent and 5.3 percent shares, respectively.
7. Where the variable POOL is used, differences between CHAIN and ADVERT are not statistically significant.
8. The conclusions in this paragraph are of the unanimous opinion of the consulting Professors of Optometry to the 1977 FTC study: Alder N. Haffner, President of the State College of Optometry, Associate Chancellor for Health Sciences, State University of New York; Edward R. Johnston, Dean of Academic Affairs, President, New York State College of Optometry; D. Loenard Werner, Professor and Chairman of the

Clinical Optometric Services Department and Director of Professional Services SUNY; Stuart M. Podell, Chief of Primary Care Optometric Department and Professor of Optometry, SUNY; Lest E. Janoff, Coordinator of Curriculum and Professor of Optometry, Pennsylvania College of Optometry. Dr. Barry Davis and Dr. Richard Zaback (NAOO Panel 1-A, J-71 (k), July 8, 1985, Tr. 1973 and 1978), representing chain firms, note that examinations should last between 20 and 30 minutes in order to meet minimum health requirements.

9. No adjustments are made for the subjects given that this is a test for minimum requirements). Adjustments for levels of detected advertising differences within Cell 2 do not affect the results.
10. A more detailed description of the survey methodology and sampling procedure is provided in Cahill et al. (1985). Like the FTC study, Cahill et al. was financially supported by a party to FTC proceeding (the American Optometric Association); the conclusion on diagnostic accuracy was questioned by FTC attorneys. As the conclusions on case history and length of examination are consistent with the 1977 FTC study, these were not challenged.
11. "An Interview with Don Phillips" *Optical Index*, 1983, 10-13.
12. Care must be taken in comparing prices across markets and cells as cost-of-living indexes are unavailable for all of the SMSAs surveyed; this is especially critical for comparisons across Cells 1 and 2, but not problematic for comparisons within Cell 2 as samples are balanced and relationships are consistent across markets. Cross-cell price comparisons (e.g. NOADV1 versus NOADV2) is difficult given the FTC design; a more complete discussion is available from the author upon request. These shortcomings in the FTC study do not detract from our tests of the hypotheses.
13. Subsequent studies in 1986 indicate that over 50 percent of nonchain practitioners were "low-volume" practices, while over 70 percent of chain firms were "high-volume" practices (Odenbach 1986).
14. Even among peer optometrists, some 19 percent were unable to assess examination of quality based on these four criteria; the authors qualify these findings due to certain design limitations in measuring judgement symmetries.
15. Public testimony by Dr. James Ellis [J-71(K)], July 8, 1985, Tr. 1943, FTC

Proceedings (Eyeglasses II).

17. The authors cite a second unpublished survey of customers patronizing a large chain firm with branches located in department stores which provide similar results.
18. Hypothetical shares based on Question (8) are 70.3 percent for nonchains and 28.6 percent for chains; differences are statistically significant at the 99 percent level; in-store advertisers are included with nonchain practices.
19. The focus here on mean differences is consistent with the previous literature; equilibria associated with perceptions of variance differences may merit further attention.

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Table 1. Classification and Characteristics of FTC Sample Cells; Examination Time

Cell	SMSA	Print Media Advertising Observed: Eyeglasses (Examination)	Chain Firm Observed	Classifications		Examination Time (TIME) (sample size)					Percent TIME > 15 minutes (Percent TIME > 20 Minutes)					
				FTC (Benham)	Price Advertising Restriction	NOADV	STORE	ADVERT	CHAIN	POOL	NOADV	STORE	ADVERT	CHAIN	POOL	
1	Knoxville	none (none)	no	most restrictive (restrictive)	severe	26.34 (38)	30.00 (1)	.	.	.	.	0.92 (.71)	1.00 (1)	.	.	.
1	LittleRock	none (none)	no	most restrictive (restrictive)	severe	25.00 (12)	.	.	.	.	.	1.00 (.75)	.	.	.	.
1	Providence	none (none)	no	most restrictive (N/A)	moderate	26.49 (51)	17.50 (4)	.	.	.	.	0.86 (.67)	0.50 (.25)	.	.	.
1	Columbia	nonprice (none)	no	restrictive (restrictive)	severe	21.00 (17)	.	.	.	.	.	0.71 (.47)	.	.	.	.
1	Greensboro	nonprice (none)	no	restrictive (restrictive)	severe	25.56 (16)	8.00 (1)	.	.	.	.	0.81 (.75)	0.00 (.00)	.	.	.
2	Milwaukee	nonprice (none)	yes	non restrictive (other)	moderate	23.00 (12)	35.00 (1)	22.14 (7)	15.00 (4)	19.55 (11)	0.92 (.67)	1.00 (1)	0.86 (.57)	1.00 (.00)	0.91 (.36)	
2	Columbus	nonprice (nonprice)	yes	non restrictive (non restrictive)	none	34.67 (6)	39.00 (2)	26.14 (7)	17.83 (6)	22.31 (13)	1.00 (1)	1.00 (1)	0.57 (.57)	0.67 (.67)	0.60 (.62)	
2	Portland	nonprice (nonprice)	yes	non restrictive (other)	moderate	21.00 (8)	10.00 (1)	11.56 (9)	11.67 (3)	11.58 (12)	1.00 (.375)	0.00 (.00)	0.33 (.11)	0.33 (.00)	0.33 (.08)	
2	Baltimore	price (nonprice)	yes	least restrictive (non restrictive)	none	32.44 (32)	22.33 (6)	12.15 (20)	14.13 (16)	13.03 (36)	0.91 (.78)	1.00 (.83)	0.30 (.10)	0.44 (.31)	0.36 (.19)	
2	Washington DC	price (nonprice)	yes	least restrictive (non restrictive)	none	28.04 (27)	23.70 (10)	17.58 (19)	12.93 (14)	15.61 (33)	0.89 (.78)	0.90 (.70)	0.63 (.42)	0.36 (.14)	0.52 (.30)	
2	Seattle	price (nonprice)	yes	least restrictive (other)	moderate	22.40 (5)	21.60 (5)	18.29 (7)	22.25 (4)	19.73 (11)	0.80 (.80)	0.80 (.80)	0.71 (.57)	0.75 (.50)	0.73 (.55)	
2	Minneapolis	price (nonprice)	yes	least restrictive (non restrictive)	moderate	32.27 (22)	17.40 (5)	19.25 (8)	20.36 (14)	19.95 (22)	0.95 (.91)	0.80 (.40)	0.63 (.38)	0.86 (.50)	0.77 (.45)	
				Aggregate	Cell 1	25.51 (134)	18.00 (6)	.	.	.	0.87 (.67)	0.50 (.33)	.	.	.	
				Aggregate	Cell 2	29.19 (112)	22.63 (30)	16.90 (77)	16.11 (61)	16.55 (138)	0.92 (.78)	0.87 (.70)	0.53 (.34)	0.59 (.33)	0.56 (.33)	

a. The SMSAs surveyed have been classified by various sources based on prevailing marketing restrictions: FTC (Bond et al. 1980), Benham (1972), and Begun and Feldman (1981) for price advertising restrictions.

b. "POOL" indicates ADVERT and CHAIN observations aggregated together.

Table 2: Regression Results on Optometric Quality and Price Offered by Advertisers; significance levels in parentheses

Model	Cells Included	Dependent Variable	Cell 1: Restricted Markets		Cell 2 Unrestricted Markets					Sample Size	R-Squared Adjusted	F
			NOADV1	STORE1	NOADV2	STORE2	ADVERT	CHAIN	POOL			
1	1 & 2	TIME	35.83 (.00)	-6.57 (.15)	3.75 (.00)	-2.74 (.23)	-7.74 (.00)	-9.39 (.00)	-	420	0.3	8.7 (.00)
2	2	TIME	-	-	41.27 (.00)	-8.25 (.00)	-11.74 (.00)	-14.07 (.00)	-	280	0.4	10.1 (.00)
3	1 & 2	TIME > 15	1.86 (.00)	-1.86 (.03)	0.57 (.18)	0.01 (.99)	-1.73 (.00)	-1.5 (.00)	-	420	-	-
4	2	TIME > 15	-	-	2.15 (.00)	-0.5 (.38)	-2.05 (.00)	-1.9 (.00)	-	288	-	-
5	1 & 2	TIME > 20	0.72 (.00)	-1.41 (.11)	0.53 (.07)	0.13 (.76)	-1.39 (.00)	-1.43 (.00)	-	420	-	-
6	2	TIME > 20	-	-	1.13 (.00)	-0.39 (.37)	-1.83 (.00)	-1.92 (.00)	-	288	-	-
7	1 & 2	PRICE/TIME	0.45 (.00)	-	0.18 (.15)	0.77 (.01)	0.45 (.00)	0.4 (.00)	-	150	0.13	2.8 (.00)
8	2	PRICE/TIME	-	-	0.52 (.01)	0.6 (.07)	0.27 (.09)	0.26 (.10)	-	104	0.13	2.2 (.02)
9	2	PRICE/TIME	-	-	0.52 (.01)	0.6 (.07)	-	-	0.27 (.04)	104	0.14	2.5 (.09)
10	1 & 2	FRAMES	2.1 (.00)	-0.36 (.35)	-0.13 (.30)	0.13 (.46)	0.27 (.09)	0.25 (.15)	-	106	0.05	2.1 (.08)
11	1 & 2	FRAMES	2.1 (.00)	-0.36 (.35)	-0.13 (.30)	0.13 (.46)	-	-	0.26 (.05)	106	0.05	2.6 (.04)
12	2	FRAMES	-	-	1.96 (.00)	0.26 (.15)	0.4 (.02)	0.38 (.04)	-	71	0.07	2.8 (.05)
13	2	FRAMES	-	-	1.96 (.00)	0.26 (.15)	-	-	0.39 (.00)	71	0.09	4.3 (.02)
14	1 & 2	BUNDLE	81.02 (.00)	-6.52 (.22)	5.98 (.00)	9.9 (.00)	-4.04 (.06)	-4.81 (.05)	-	280	0.20	4.8 (.00)
15	2	BUNDLE	-	-	85.62 (.00)	1.71 (.61)	-10.19 (.00)	-12.03 (.00)	-	182	0.23	4.3 (.00)
16	1 & 2	BUNDLE1	66.16 (.00)	-6.29 (.23)	3.69 (.11)	12.07 (.00)	-4.49 (.07)	3.33 (.30)	-	199	0.16	3.1 (.00)
17	2	BUNDLE1	-	-	66.7 (.00)	7.3 (.05)	-8.02 (.00)	-1.55 (.67)	-	125	0.15	2.3 (.00)
18	1 & 2	BUNDLE2	2.63 (.00)	1.17 (.19)	0.06 (.00)	0.58 (.28)	1.79 (.00)	1.65 (.00)	-	194	0.18	3.3 (.00)
19	2	BUNDLE2	-	-	2 (.00)	0.9 (.15)	1.92 (.00)	1.93 (.00)	-	122	0.25	3.5 (.00)

Note: a. Cell models except 3, 4, 5, and 6 are adjusted for subject dummies; OLS Estimation; "POOL" indicates ADVERT and CHAIN observations aggregated together  
 b. Logit estimates are reported for models 3, 4, 5 and 6.  
 c. In models with Cell 1 & 2 included, NOADV1 is the constant term; otherwise NOADV2 is the constant term.

Table 3: 1985 Survey Subjects' Eye Conditions

Eye Condition	Description <sup>a</sup>
Anisocoria	Occurs in 20 percent population
Astigmatism 0.5 to	Approximately 40 percent of the population has astigmatism of 1.5 diopters; subjects had 0.75 to 1.25 diopters.
Muscle Imbalance (Hyperphoria and having	Incidence from 15 to 30 percent of the population; 1 percent hypertropias) vertical imbalances.
Diabetic Retinopathy is	Prevalent in 4 million persons (1.6 percent of the population) and leading cause of blindness.
Retinoschisis	Most frequent in persons over 40 years old.

Source: Cahill et al. (1985)

Table 4: Quality of Eye Examinations: Private Practitioners versus Chain Firms: 1985

Subject Number	Sample Size: Number of Exams		Number of Exam: Including Medical History		Average Length of Examinations (in minutes)		Examinations Detecting Eye Condition	
	Private	Chain	Private	Chain	Private	Chain	Private	Chain
1	5	4	1	1	32.0	6.4	4	1
2	4	5	2	4	12.0	5.4	1	2
3	5	5	4	2	34.4	7.8	5	1
4	3	5	3	1	25.0	10.0	5	3
5	5	4	3	1	85.0	25.3	2	1
6	5	5	4	3	25.4	13.6	4	2
7	5	5	4	2	33.0	21.0	2	0
8	5	5	4	4	37.0	21.0	3	2
9	5	5	3	2	26.0	15.0	2	1
10	5 <sup>a</sup>	5	4	1	25.1	13.4	3	4
11	5	5	5	4	24.0	12.6	0	0
<b>Total/Average</b>	<b>52</b>	<b>53</b>	<b>37</b>	<b>25</b>	<b>31.0</b>	<b>13.7</b>	<b>31</b>	<b>17</b>
<b>t-statistic (proportions)</b>			<b>2.71</b>		<b>4.21</b>		<b>2.88</b>	
<b>Significance</b>			<b>.01</b>		<b>.01</b>		<b>.01</b>	

a. Information on medical history is not available for one examination

Table 5: FTC Characteristics Total Package Price, Example Price/TIME (unbundled), Frame Markup (Unbundled)

CELL SMSA	TOTAL PRICE (Sample Size)					PRICE/TIME (Sample Size)					ADJUSTED FRAME PRICES (Sample Size)				
	NOADV	STORE	ADVERT	CHAIN	POOL	NOADV	STORE	ADVERT	CHAIN	POOL	NOADV	STORE	ADVERT	CHAIN	POOL
1 Knoxville	85.43 (21)	80.00 (1)	. (.)	. (.)	. (.)	1.03 (17)	. (.)	. (.)	. (.)	. (.)	2.19 (12)	1.82 (1)	. (.)	. (.)	. (.)
1 LittleRock	84.00 (12)	. (.)	. (.)	. (.)	. (.)	. (.)	. (.)	. (.)	. (.)	. (.)	2.06 (5)	. (.)	. (.)	. (.)	. (.)
1 Providence	69.43 (23)	65.75 (4)	. (.)	. (.)	. (.)	0.83 (29)	. (.)	. (.)	. (.)	. (.)	1.91 (7)	1.67 (1)	. (.)	. (.)	. (.)
1 Columbia	86.61 (18)	. (.)	. (.)	. (.)	. (.)	. (.)	. (.)	. (.)	. (.)	. (.)	2.13 (6)	. (.)	. (.)	. (.)	. (.)
1 Greensboro	75.40 (18)	86.00 (1)	. (.)	. (.)	. (.)	. (.)	. (.)	. (.)	. (.)	. (.)	2.18 (3)	. (.)	. (.)	. (.)	. (.)
2 Milwaukee	77.88 (12)	72.00 (1)	71.91 (7)	63.58 (5)	68.44 (12)	. (.)	. (.)	. (.)	. (.)	. (.)	2.26 (4)	. (.)	2.30 (1)	2.82 (3)	2.69 (4)
2 Columbus	82.33 (6)	92.75 (2)	91.10 (7)	95.50 (6)	93.13 (13)	. (.)	. (.)	. (.)	. (.)	. (.)	2.05 (2)	. (.)	2.59 (2)	2.30 (2)	2.44 (4)
2 Portland	78.95 (6)	78.00 (1)	71.04 (9)	75.00 (3)	72.03 (12)	1.23 (2)	. (.)	. (.)	. (.)	. (.)	1.68 (4)	. (.)	1.92 (3)	. (.)	1.92 (3)
2 Baltimore	91.14 (14)	88.40 (5)	70.25 (11)	63.57 (6)	67.89 (17)	0.96 (19)	1.25 (1)	1.58 (9)	1.32 (11)	1.44 (20)	2.01 (11)	2.12 (3)	2.47 (4)	3.10 (1)	2.59 (5)
2 Washington	88.82 (11)	82.20 (8)	72.22 (9)	63.84 (7)	68.56 (16)	1.27 (17)	1.72 (3)	1.78 (10)	1.39 (7)	1.27 (17)	2.00 (3)	2.35 (2)	2.75 (4)	3.13 (1)	2.83 (5)
2 Seattle	94.12 (5)	98.24 (5)	81.40 (7)	82.19 (4)	81.69 (11)	. (.)	. (.)	. (.)	. (.)	. (.)	2.52 (1)	2.45 (5)	2.06 (1)	. (.)	2.06 (1)
2 Minneapolis	80.70 (10)	84.68 (5)	67.73 (4)	70.63 (6)	69.47 (10)	0.90 (13)	. (.)	1.06 (4)	0.93 (8)	0.97 (12)	1.76 (6)	1.74 (2)	1.74 (1)	1.79 (5)	1.78 (6)
Cell 1	79.51 (92)	71.50 (6)	. (.)	. (.)	. (.)	0.90 (46)	. (.)	. (.)	. (.)	. (.)	2.10 (33)	1.75 (2)	. (.)	. (.)	. (.)
Cell 2	84.89 (64)	87.03 (27)	74.89 (54)	72.88 (37)	74.07 (91)	1.07 (51)	1.60 (4)	1.31 (23)	1.22 (26)	1.26 (49)	1.97 (31)	2.23 (12)	2.37 (16)	2.35 (12)	2.36 (28)

a. "POOL" indicates ADVERT and CHAIN observations aggregated together

Table 6: Eyeglass Frames, Wholesale List Prices Collected by the FTC, 1977

	Sample Size	Percent of Sample	Minimum Price	Maximum Price	Average Price	Standard Deviation
<u>Category</u>						
1. Linear American Optical	54	27	16.50	16.50	16.50	0
2. Other American Optical	15	7	13.95	18.25	16.51	1.42
3. Other US Brands	84	42	6.95	18.20	13.68	2.05
4. Western European Brands	25	13	8.95	19.95	13.01	3.26
5. Japan	16	8	4.50	11.95	9.53	1.82
6. Other	5	3	9.95	14.95	13.10	2.21
	199	100	4.5	19.95	14.23	2.75

Table 7: "Informed" Subjective Assessments of Eye Examination Quality: Logit models of the FTC Survey, 1977  
significance levels in parentheses

Model	Cells Included	Dependent Variable	Cell 1: Restricted Markets		Cell 2 Unrestricted Markets				Sample Size
			NOADV1	STORE1	NOADV2	STORE2	ADVERT	CHAIN	
1	1 & 2	HISTORY	-0.23 (.18)	-0.46 (.60)	0.53 (.04)	-0.83 (.06)	-1.81 (.00)	-0.95 (.00)	434
2	2	HISTORY	-	-	0.3 (.12)	-1.35 (.00)	-2.33 (.00)	-1.48 (.00)	288
3	1 & 2	EXAM	-0.38 (.03)	0.38 (.65)	0.5 (.05)	0.05 (.90)	-1.54 (.00)	-1.31 (.00)	434
4	2	EXAM	-	-	0.12 (.51)	-0.45 (.28)	-2.04 (.00)	-1.81 (.00)	288
5	1 & 2	VISION	-0.17 (.31)	0.17 (.83)	0.84 (.00)	0.63 (.12)	-1.03 (.00)	-0.62 (.05)	434
6	2	VISION	-	-	0.67 (.00)	-0.21 (.62)	-1.87 (.00)	-1.46 (.00)	288
7	1 & 2	DIAGONIS	-0.23 (.18)	-0.46 (.60)	0.53 (.04)	-0.83 (.06)	-1.81 (.00)	-0.95 (.00)	434
8	2	DIAGONIS	-	-	0.19 (.31)	-1.09 (.01)	-1.63 (.00)	-1.05 (.00)	288
9	1 & 2	THOROUGH	-0.17 (.31)	0.17 (.84)	0.84 (.00)	0.63 (.12)	-1.03 (.00)	-0.62 (.05)	434
10	2	THOROUGH	-	-	1.68 (.00)	-0.79 (.09)	-1.99 (.00)	-2.4 (.00)	288
11	1 & 2	COMPETENT	-0.38 (.03)	0.38 (.65)	0.5 (.05)	0.05 (.90)	-1.54 (.00)	-1.31 (.00)	434
12	2	COMPETENT	-	-	0.83 (.00)	-0.63 (.12)	-2.26 (.00)	-1.84 (.00)	288
13	1 & 2	SENDEXAM	-0.38 (.03)	0.38 (.65)	0.5 (.05)	0.05 (.90)	-1.54 (.00)	-1.31 (.00)	434
14	2	SENDEXAM	-	-	0.16 (.40)	-0.75 (.07)	-2.19 (.00)	-1.84 (.00)	288
15	1 & 2	SENDRX	-0.17 (.31)	0.17 (.84)	0.84 (.00)	0.63 (.63)	-1.03 (.00)	-0.62 (.05)	434
16	2	SENDRX	-	-	0.71 (.00)	-0.51 (.21)	-1.98 (.00)	-1.64 (.00)	288
17	1 & 2	SENDCOMPLEX	-0.23 (.18)	-0.46 (.60)	0.53 (.04)	-0.83 (.06)	-1.81 (.00)	-0.95 (.00)	434
18	2	SENDCOMPLEX	-	-	-0.3 (.11)	-1.13 (.02)	-2.19 (.00)	-2.71 (.00)	288

a. Logit estimates are reported. Significance levels are insensitive to probit, logistic and OLS estimation procedures

b. In models with Cell 1 & 2 included, NOADV1 is the constant term; otherwise, NOADV2 is the constant term.

**Table 8: Survey of Chain Firms: Prices/Quality of Sample Eye Glass Prescription Filled**

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<b>Commercial Firm</b>	<b>Price Paid -Dollars-</b>	<b>Quality Grade</b>
For Eyes	26.00	"acceptable"
Sterling Optical	28.00	"flunked"
Peoples Drug Store	37.50	"best"
Voorthuis Optical	42.00	"flunked"
Sears	59.00	"worst"

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**Source:** "Eyeglass Prescriptions," News Seven Program, WJLA Televisions, Washington, D.C., aired January 14-15, 1985, 6:00 p.m., EST.

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89/50	Jean DERMINE	"The specialization of financial institutions, the EEC model", August 1989.	89/63 (TM)	Enver YUCESAN and Lee SCHRUBEN	"Equivalence of simulations: A graph approach", November 1989.
89/51	Spyros MAKRIDAKIS	"Sliding simulation: a new approach to time series forecasting", July 1989.	89/64 (TM)	Enver YUCESAN and Lee SCHRUBEN	"Complexity of simulation models: A graph theoretic approach", November 1989.
89/52	Arnoud DE MEYER	"Shortening development cycle times: a manufacturer's perspective", August 1989.	89/65 (TM, AC, FIN)	Soumitra DUTTA and Piero BONISSONE	"MARS: A mergers and acquisitions reasoning system", November 1989.
89/53	Spyros MAKRIDAKIS	"Why combining works?", July 1989.	89/66 (TM,EP)	B. SINCLAIR-DESGAGNÉ	"On the regulation of procurement bids", November 1989.
89/54	S. BALAKRISHNAN and Mitchell KOZA	"Organisation costs and a theory of joint ventures", September 1989.	89/67 (FIN)	Peter BOSSAERTS and Pierre HILLION	"Market microstructure effects of government intervention in the foreign exchange market", December 1989.
89/55	H. SCHUTTE	"Euro-Japanese cooperation in information technology", September 1989.			
89/56	Wilfried VANHONACKER and Lydia PRICE	"On the practical usefulness of meta-analysis results", September 1989.			
			<u>1990</u>		
89/57	Taekwon KIM, Lars-Hendrik RÖLLER and Mihkel TOMBAK	"Market growth and the diffusion of multiproduct technologies", September 1989.	90/01 TM/EP/AC	B. SINCLAIR-DESGAGNÉ	"Unavoidable Mechanisms", January 1990.
89/58 (EP, TM)	Lars-Hendrik RÖLLER and Mihkel TOMBAK	"Strategic aspects of flexible production technologies", October 1989.	90/02 EP	Michael BURDA	"Monopolistic Competition, Costs of Adjustment, and the Behaviour of European Manufacturing Employment", January 1990.
89/59 (OB)	Manfred KETS DE VRIES, Daphna ZEVADI, Alain NOEL and Mihkel TOMBAK	"Locus of control and entrepreneurship: a three-country comparative study", October 1989.	90/03 TM	Arnoud DE MEYER	"Management of Communication in International Research and Development", January 1990.
89/60 (TM)	Enver YUCESAN and Lee SCHRUBEN	"Simulation graphs for design and analysis of discrete event simulation models", October 1989.	90/04 FIN/EP	Gabriel HAWAWINI and Eric RAJENDRA	"The Transformation of the European Financial Services Industry: From Fragmentation to Integration", January 1990.
89/61 (All)	Susan SCHNEIDER and Arnoud DE MEYER	"Interpreting and responding to strategic issues: The impact of national culture", October 1989.	90/05 FIN/EP	Gabriel HAWAWINI and Bertrand JACQUILLAT	"European Equity Markets: Toward 1992 and Beyond", January 1990.

90/06 FIN/EP	Gabriel HAWAWINI and Eric RAJENDRA	"Integration of European Equity Markets: Implications of Structural Change for Key Market Participants to and Beyond 1992", January 1990.	90/17 FIN	Nathalie DIERKENS	"Information Asymmetry and Equity Issues", Revised January 1990.
90/07 FIN/EP	Gabriel HAWAWINI	"Stock Market Anomalies and the Pricing of Equity on the Tokyo Stock Exchange", January 1990.	90/18 MKT	Wilfried VANHONACKER	"Managerial Decision Rules and the Estimation of Dynamic Sales Response Models", Revised January 1990.
90/08 TM/EP	Tawfik JELASSI and B. SINCLAIR-DESGAGNÉ	"Modelling with MCDSS: What about Ethics?", January 1990.	90/19 TM	Beth JONES and Tawfik JELASSI	"The Effect of Computer Intervention and Task Structure on Bargaining Outcome", February 1990.
90/09 EP/FIN	Alberto GIOVANNINI and Jac WON PARK	"Capital Controls and International Trade Finance", January 1990.	90/20 TM	Tawfik JELASSI, Gregory KERSTEN and Stanley ZIANTS	"An Introduction to Group Decision and Negotiation Support", February 1990.
90/10 TM	Joyce BRYER and Tawfik JELASSI	"The Impact of Language Theories on DSS Dialog", January 1990.	90/21 FIN	Roy SMITH and Ingo WALTER	"Reconfiguration of the Global Securities Industry in the 1990's", February 1990.
90/11 TM	Enver YUCESAN	"An Overview of Frequency Domain Methodology for Simulation Sensitivity Analysis", January 1990.	90/22 FIN	Ingo WALTER	"European Financial Integration and Its Implications for the United States", February 1990.
90/12 EP	Michael BURDA	"Structural Change. Unemployment Benefits and High Unemployment: A U.S.-European Comparison", January 1990.	90/23 EP/SM	Damien NEVEN	"EEC Integration towards 1992: Some Distributional Aspects", Revised December 1989
90/13 TM	Soumitra DUTTA and Shashi SHEKHAR	"Approximate Reasoning about Temporal Constraints in Real Time Planning and Search", January 1990.	90/24 FIN/EP	Lars Tyge NIELSEN	"Positive Prices in CAPM", January 1990.
90/14 TM	Albert ANGEHRN and Hans-Jakob LÜTHI	"Visual Interactive Modelling and Intelligent DSS: Putting Theory Into Practice", January 1990.	90/25 FIN/EP	Lars Tyge NIELSEN	"Existence of Equilibrium in CAPM", January 1990.
90/15 TM	Arnoud DE MEYER, Dirk DESCHOOLMEESTER, Rudy MOENAERT and Jan BARBE	"The Internal Technological Renewal of a Business Unit with a Mature Technology", January 1990.	90/26 OB/BP	Charles KADUSHIN and Michael BRIMM	"Why networking Fails: Double Binds and the Limitations of Shadow Networks", February 1990.
90/16 FIN	Richard LEVICH and Ingo WALTER	"Tax-Driven Regulatory Drag: European Financial Centers in the 1990's", January 1990.	90/27 TM	Abbas FOROUGHFI and Tawfik JELASSI	"NSS Solutions to Major Negotiation Stumbling Blocks", February 1990.
			90/28 TM	Arnoud DE MEYER	"The Manufacturing Contribution to Innovation", February 1990.

90/29 FIN/AC	Nathalie DIERKENS	"A Discussion of Correct Measures of Information Asymmetry", January 1990.	90/40 OB	Manfred KETS DE VRIES	"Leaders on the Couch: The case of Roberto Calvi", April 1990.
90/30 FIN/EP	Lars Tyge NIELSEN	"The Expected Utility of Portfolios of Assets", March 1990.	90/41 FIN/EP	Gabriel HAWAWINI, Itzhak SWARY and Ik HWAN JANG	"Capital Market Reaction to the Announcement of Interstate Banking Legislation", March 1990.
90/31 MKT/EP	David GAUTSCHI and Roger BETANCOURT	"What Determines U.S. Retail Margins?", February 1990.	90/42 MKT	Joel STECKEL and Wilfried VANHONACKER	"Cross-Validating Regression Models in Marketing Research", (Revised April 1990).
90/32 SM	Srinivasan BALAK- RISHNAN and Mitchell KOZA	"Information Asymmetry, Adverse Selection and Joint-Ventures: Theory and Evidence", Revised, January 1990.	90/43 FIN	Robert KORAJCZYK and Claude VIALLET	"Equity Risk Premium and the Pricing of Foreign Exchange Risk", May 1990.
90/33 OB	Caren SIEHL, David BOWEN and Christine PEARSON	"The Role of Rites of Integration in Service Delivery", March 1990.	90/44 OB	Gilles AMADO, Claude FAUCHEUX and André LAURENT	"Organisational Change and Cultural Realities: Franco-American Contrasts", April 1990.
90/34 FIN/EP	Jean DERMINE	"The Gains from European Banking Integration, a Call for a Pro-Active Competition Policy", April 1990.	90/45 TM	Soumitra DUTTA and Piero BONISSONE	"Integrating Case Based and Rule Based Reasoning: The Possibilistic Connection", May 1990.
90/35 EP	Jaе Won PARK	"Changing Uncertainty and the Time-Varying Risk Premium in the Term Structure of Nominal Interest Rates", December 1988, Revised March 1990.	90/46 TM	Spyros MAKRIDAKIS and Michèle HIBON	"Exponential Smoothing: The Effect of Initial Values and Loss Functions on Post-Sample Forecasting Accuracy".
90/36 TM	Arnoud DE MEYER	"An Empirical Investigation of Manufacturing Strategies in European Industry", April 1990.	90/47 MKT	Lydia PRICE and Wilfried VANHONACKER	"Improper Sampling in Natural Experiments: Limitations on the Use of Meta-Analysis Results in Bayesian Updating", Revised May 1990.
90/37 TM/OB/SM	William CATS-BARIL	"Executive Information Systems: Developing an Approach to Open the Possibles", April 1990.	90/48 EP	Jaе WON PARK	"The Information in the Term Structure of Interest Rates: Out-of-Sample Forecasting Performance", June 1990.
90/38 MKT	Wilfried VANHONACKER	"Managerial Decision Behaviour and the Estimation of Dynamic Sales Response Models", (Revised February 1990).	90/49 TM	Soumitra DUTTA	"Approximate Reasoning by Analogy to Answer Null Queries", June 1990.
90/39 TM	Louis LE BLANC and Tawfik JELASSI	"An Evaluation and Selection Methodology for Expert System Shells", May 1990.	90/50 EP	Daniel COHEN and Charles WYPLOSZ	"Price and Trade Effects of Exchange Rates Fluctuations and the Design of Policy Coordination", April 1990.

90/51 EP	Michael BURDA and Charles WYPLOSZ	"Gross Labour Market Flows in Europe: Some Stylized Facts", June 1990.	90/63 SM	Sumantra GHOSHAL and Eleanor WESTNEY	"Organising Competitor Analysis Systems", August 1990
90/52 FIN	Lars Tye NIELSEN	"The Utility of Infinite Menus", June 1990.	90/64 SM	Sumantra GHOSHAL	"Internal Differentiation and Corporate Performance: Case of the Multinational Corporation", August 1990
90/53 EP	Michael Burda	"The Consequences of German Economic and Monetary Union", June 1990.	90/65 EP	Charles WYPLOSZ	"A Note on the Real Exchange Rate Effect of German Unification", August 1990
90/54 EP	Damien NEVEN and Colin MEYER	"European Financial Regulation: A Framework for Policy Analysis", (Revised May 1990).	90/66 TM/SE/FIN	Soumitra DUTTA and Piero BONISSONE	"Computer Support for Strategic and Tactical Planning in Mergers and Acquisitions", September 1990
90/55 EP	Michael BURDA and Stefan GERLACH	"Intertemporal Prices and the US Trade Balance", (Revised July 1990).	90/67 TM/SE/FIN	Soumitra DUTTA and Piero BONISSONE	"Integrating Prior Cases and Expert Knowledge In a Mergers and Acquisitions Reasoning System", September 1990
90/56 EP	Damien NEVEN and Lars-Hendrik RÖLLER	"The Structure and Determinants of East-West Trade: A Preliminary Analysis of the Manufacturing Sector", July 1990	90/68 TM/SE	Soumitra DUTTA	"A Framework and Methodology for Enhancing the Business Impact of Artificial Intelligence Applications", September 1990
90/57 FIN/EP/ TM	Lars Tye NIELSEN	Common Knowledge of a Multivariate Aggregate Statistic", July 1990	90/69 TM	Soumitra DUTTA	"A Model for Temporal Reasoning in Medical Expert Systems", September 1990
90/58 FIN/EP/TM	Lars Tye NIELSEN	"Common Knowledge of Price and Expected Cost in an Oligopolistic Market", August 1990	90/70 TM	Albert ANGEHRN	"Triple C': A Visual Interactive MCDSS", September 1990
90/59 FIN	Jean DERMINE and Lars-Hendrik RÖLLER	"Economies of Scale and Scope in the French Mutual Funds (SICAV) Industry", August 1990	90/71 MKT	Philip PARKER and Hubert GATIGNON	"Competitive Effects in Diffusion Models: An Empirical Analysis", September 1990
90/60 TM	Peri IZ and Tawfik JELASSI	"An Interactive Group Decision Aid for Multiobjective Problems: An Empirical Assessment", September 1990	90/72 TM	Enver YÜCESAN	"Analysis of Markov Chains Using Simulation Graph Models", October 1990
90/61 TM	Pankaj CHANDRA and Mihkel TOMBAK	"Models for the Evaluation of Manufacturing Flexibility", August 1990	90/73 TM	Arnoud DE MEYER and Kasra FERDOWS	"Removing the Barriers in Manufacturing", October 1990
90/62 EP	Damien NEVEN and Menno VAN DIJK	"Public Policy Towards TV Broadcasting in the Netherlands", August 1990	90/74 SM	Sumantra GHOSHAL and Nitin NOHRIA	"Requisite Complexity: Organising Headquarters- Subsidiary Relations in MNCs", October 1990

90/75 MKT	Roger BETANCOURT and David GAUTSCHI	"The Outputs of Retail Activities: Concepts, Measurement and Evidence", October 1990	90/87 FIN/EP	Lars Tyge NIELSEN	"Existence of Equilibrium in CAPM: Further Results", December 1990
90/76 MKT	Wilfried VANHONACKER	"Managerial Decision Behaviour and the Estimation of Dynamic Sales Response Models", Revised October 1990	90/88 OB/MKT	Susan C. SCHNEIDER and Reinhard ANGELMAR	"Cognition in Organisational Analysis: Who's Minting the Store?" Revised, December 1990
90/77 MKT	Wilfried VANHONACKER	"Testing the Keych Scheme of Sales Response to Advertising: An Aggregation-Independent Autocorrelation Test", October 1990	90/89 OB	Manfred F.R. KETS DE VRIES	"The CEO Who Couldn't Talk Straight and Other Tales from the Board Room," December 1990
90/78 EP	Michael BURDA and Stefan GERLACH	"Exchange Rate Dynamics and Currency Unification: The Ostmark - DM Rate", October 1990	90/90 MKT	Philip PARKER	"Price Elasticity Dynamics over the Adoption Lifecycle: An Empirical Study," December 1990
90/79 TM	Anil GABA	"Inferences with an Unknown Noise Level in a Bernoulli Process", October 1990			
90/80 TM	Anil GABA and Robert WINKLER	"Using Survey Data in Inferences about Purchase Behaviour", October 1990	<u>1991</u>		
90/81 TM	Tawfik JELASSI	"Du Présent au Futur: Bilan et Orientations des Systèmes Interactifs d'Aide à la Décision," October 1990	91/01 TM/SM	Luk VAN WASSENHOVE, Leonard FORTUIN and	"Operational Research Can Do More for Managers Than They Think!,"
90/82 EP	Charles WYPLOSZ	"Monetary Union and Fiscal Policy Discipline," November 1990	91/02 TM/SM	Luk VAN WASSENHOVE, Leonard FORTUIN and Paul VAN BEEK	"Operational Research and Environment," January 1991
90/83 FIN/TM	Nathalie DIERKENS and Bernard SINCLAIR-DESGAGNE	"Information Asymmetry and Corporate Communication: Results of a Pilot Study", November 1990	91/03 FIN	Pekka HIETALA and Timo LÖYTTYNIEMI	"An Implicit Dividend Increase in Rights Issues: Theory and Evidence," January 1991
90/84 MKT	Philip M. PARKER	"The Effect of Advertising on Price and Quality: The Optometric Industry Revisited," December 1990	91/04 FIN	Lars Tyge NIELSEN	"Two-Fund Separation, Factor Structure and Robustness," January 1991
90/85 MKT	Avijit GHOSH and Vikas TIBREWALA	"Optimal Timing and Location in Competitive Markets," November 1990	91/05 OB	Susan SCHNEIDER	"Managing Boundaries in Organisations," January 1991
90/86 EP/TM	Olivier CADOT and Bernard SINCLAIR-DESGAGNE	"Prudence and Success in Politics," November 1990	91/06 OB	Manfred KETS DE VRIES, Denny MILLER and Alain NOEL	"Understanding the Leader-Strategy Interface: Application of the Strategic Relationship Interview Method," January 1990 (89/11, revised April 1990)

91/07 EP	Olivier CADOT	"Leading to Insolvent Countries: A Paradoxical Story," January 1991	91/19 MKT	Vikas TIBREWALA and Bruce BUCHANAN	"An Aggregate Test of Purchase Regularity", March 1991
91/08 EP	Charles WYPLOSZ	"Post-Reform East and West: Capital Accumulation and the Labour Mobility Constraint," January 1991	91/20 MKT	Darius SABAVALA and Vikas TIBREWALA	"Monitoring Short-Run Changes in Purchasing Behaviour", March 1991
91/09 TM	Spyros MAKRIDAKIS	"What can we Learn from Failure?", February 1991	91/21 SM	Sumantra GHOSHAL, Harry KORINE and Gabriel SZULANSKI	"Interunit Communication within MNCs: The Influence of Formal Structure Versus Integrative Processes", April 1991
91/10 TM	Luc Van WASSENHOVE and C. N. POTTS	"Integrating Scheduling with Batching and Lot-Sizing: A Review of Algorithms and Complexity", February 1991	91/22 EP	David GOOD, Lars-Hendrik RÖLLER and Robin SICKLES	"EC Integration and the Structure of the Franco-American Airline Industries: Implications for Efficiency and Welfare", April 1991
91/11 TM	Luc VAN WASSENHOVE et al.	"Multi-Item Lotsizing in Capacitated Multi-Stage Serial Systems", February 1991	91/23 TM	Spyros MAKRIDAKIS and Michèle HIBON	"Exponential Smoothing: The Effect of Initial Values and Loss Functions on Post-Sample Forecasting Accuracy", April 1991 (Revision of 90/46)
91/12 TM	Albert ANGEHRN	"Interpretative Computer Intelligence: A Link between Users, Models and Methods in DSS", February 1991	91/24 TM	Louis LE BLANC and Tawfik JELASSI	"An Empirical Assessment of Choice Models for Software Evaluation and Selection", May 1991
91/13 EP	Michael BURDA	"Labor and Product Markets in Czechoslovakia and the Ex-GDR: A Twin Study", February 1991	91/25 SM/TM	Luk N. VAN WASSENHOVE and Charles J. CORBETT	"Trade-Offs? What Trade-Offs?" April 1991
91/14 MKT	Roger BETANCOURT and David GAUTSCHI	"The Output of Retail Activities: French Evidence", February 1991	91/26 TM	Luk N. VAN WASSENHOVE and C.N. POTTS	"Single Machine Scheduling to Minimize Total Late Work", April 1991
91/15 OB	Manfred F.R. KETS DE VRIES	"Exploding the Myth about Rational Organisations and Executives", March 1991	91/27 FIN	Nathalie DIERKENS	"A Discussion of Correct Measures of Information Asymmetry: The Example of Myers and Majluf's Model or the Importance of the Asset Structure of the Firm", May 1991
91/16 TM	Arnoud DE MEYER and Kasra FERDOWS et.al.	"Factories of the Future: Executive Summary of the 1990 International Manufacturing Futures Survey", March 1991	91/28 MKT	Philip M. PARKER	"A Note on: 'Advertising and the Price and Quality of Optometric Services', June 1991
91/17 TM	Dirk CATTRYSSE, Roelof KUIK, Marc SALOMON and Luk VAN WASSENHOVE	"Heuristics for the Discrete Lotsizing and Scheduling Problem with Setup Times", March 1991	91/29 TM	Tawfik JELASSI and Abbas FOROUGHI	"An Empirical Study of an Interactive, Session-Oriented Computerised Negotiation Support System (NSS)", June 1991
91/18 TM	C.N. POTTS and Luk VAN WASSENHOVE	"Approximation Algorithms for Scheduling a Single Machine to Minimize Total Late Work", March 1991			

91/30 MKT	Wilfried R. VANHONACKER and Lydia J. PRICE	"Using Meta-Analysis Results in Bayesian Updating: The Empty Cell Problem", June 1991	91/43 SM	Sumantra GHOSHAL and Christopher BARTLETT	"Building Transnational Capabilities: The Management Challenge", September 1991
91/31 FIN	Rezaul KABIR and Theo VERMAELEN	"Insider Trading Restrictions and the Stock Market", June 1991	91/44 SM	Sumantra GHOSHAL and Nitin NOHRIA	"Distributed Innovation in the 'Differentiated Network' Multinational", September 1991
91/32 OB	Susan C. SCHNEIDER	"Organisational Sensemaking: 1992", June 1991			
91/33 EP	Michael C. BURDA and Michael FUNKE	"German Trade Unions after Unification - Third Degree Wage Discriminating Monopolists?", June 1991			
91/34 FIN	Jean DERMINE	"The BIS Proposal for the Measurement of Interest Rate Risk, Some Pitfalls", June 1991			
91/35 FIN	Jean DERMINE	"The Regulation of Financial Services in the EC, Centralization or National Autonomy?" June 1991			
91/36 TM	Albert ANGEHRN	"Supporting Multicriteria Decision Making: New Perspectives and New Systems", August 1991			
91/37 EP	Ingo WALTER and Hugh THOMAS	"The Introduction of Universal Banking in Canada: An Event Study", August 1991			
91/38 EP	Ingo WALTER and Anthony SAUNDERS	"National and Global Competitiveness of New York City as a Financial Center", August 1991			
91/39 EP	Ingo WALTER and Anthony SAUNDERS	"Reconfiguration of Banking and Capital Markets in Eastern Europe", August 1991			
91/40 TM	Luk VAN WASSENHOVE, Dirk CATTRYSSE and Marc SALOMON	"A Set Partitioning Heuristic for the Generalized Assignment Problem", August 1991			
91/41 TM	Luk VAN WASSENHOVE, M.Y. KOVALYOU and C.N. POTTS	"A Fully Polynomial Approximation Scheme for Scheduling a Single Machine to Minimize Total Weighted Late Work", August 1991			
91/42 TM	Rob R. WEITZ and Tawfik JELASSI	"Solving A Multi-Criteria Allocation Problem: A Decision Support System Approach", August 1991			