

**"A NOTE ON: 'ADVERTISING AND THE PRICE AND  
QUALITY OF OPTOMETRIC SERVICES'"**

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# A NOTE ON: "ADVERTISING AND THE PRICE AND QUALITY OF OPTOMETRIC SERVICES"

## Abstract

Theoretical research has long debated whether advertising increases market efficiencies (fostering high quality, low-priced products) or leads to market failure (fostering low-quality, higher-priced rip-offs). This note reevaluates data collected by the U.S. Federal Trade Commission in 1977 and reported in Kwoka (1984) who finds that marketing deregulation reduces prices of eye examinations without a decline in market quality. Our re-analysis of the data reveals possible market failure in the optometric industry: an erosion of eye examination quality without a decline in prices. This conclusion is supported by recent trends within this industry and empirical findings in related professions.

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

## I. Introduction

Theoretical research has long debated whether advertising increases market efficiencies (fostering high quality, low-priced products) or leads to market failure (fostering low-quality, higher-priced rip-offs). Empirical studies of the optometric industry have generally shown that restrictions existing to prohibit the growth of chain firms or of advertising increase market prices without gains in eye care quality or consumer welfare.<sup>1</sup> Among these, John Kwoka (1984) tests the lemons hypothesis and finds that economies associated advertising should generate price declines without an erosion of quality. Relying on data gathered prior to the impact of the Supreme Court's 1977 Bates decision which found advertising restrictions unconstitutional, Kwoka's major conclusions include:

- C1: All optometrists in pre-Bates advertising markets lower their prices (unadjusted for quality) compared to restrictive markets (p. 214).
- C2: The mean time spent for examinations in pre-Bates advertising markets is actually longer [in nonrestrictive markets] than in pre-Bates restrictive markets (p. 215).
- C3: The removal of advertising restrictions [implying a post-Bates environment] would cause constant quality prices to decline without a decline in overall market quality (p. 216).

The abundance of convergent studies has 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.<sup>2</sup> This note reevaluates data collected by the FTC in 1977 and analyzed in Kwoka in order to reconsider the hypothesis that advertising deregulation has lowered market prices without reducing optometric quality. The final section discusses plausible explanations for the apparent divergence between this and previous findings.

## II. Re-evaluation of the FTC Data

The sub-sample of the 1977 FTC data analyzed in Kwoka is retained here with the goal of testing the existence of market failure. Optometrists in the FTC survey are

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<sup>1</sup> See Deborah Haas-Wilson, 1986, and Roger Feldman and James Begun, 1985 and references cited therein.

<sup>2</sup> See FTC proceedings for Trade Regulation Rule on Ophthalmic Advertising (known as Eyeglasses I) and FTC Ophthalmic Practice Rules--proposed trade regulation rule (Eyeglasses II).

classified as belonging to two pre-Bates environments: (1) markets where chain firms and price advertising for eyeglasses and nonprice advertising for examinations were present; and (2) markets where advertising and chain firms were not present (only nonadvertisers were observed in these markets). In markets where both advertising and chain firms were present, optometrists are further classified as nonadvertisers (NONE), in-store advertisers (STORE), small-media advertisers not associated with national chains (SMED), and optometrists associated with large national chains (LMED). The sample consists of 147 observations collected in two standard metropolitan statistical areas (SMSAs) where there was an absence of chain firms and advertising and three SMSAs where advertising and chain firms were present (Table 1, Panel A summarizes cell means, sample sizes, and aggregate averages across these markets).<sup>3</sup>

Within each nonrestrictive SMSA, stratified sampling "was necessary because practitioners in large chain optical firms and practitioners in local optical firms were generally a small percentage of all practitioners. Hence, a simple random sample of all practitioners would have generated very few observations for advertisers" (Ronald Bond et al., p. 43, 1980). Relatively few chain firm ( $n=26$ ) and small firm ( $n=23$ ) advertisers were visited across the three nonrestrictive SMSAs. As the observations are pooled across cells, the underlying FTC data have been adjusted for cost of living (COLA), income per capita (YPC), and number of optometrists per capita (ODPC) across the SMSAs. Given the key role these adjustments have in obtaining pooled estimates of price and quality, the following discussion examines their reasonableness. The adjustments were used to replicate Kwoka's "Base" price model reported in Table 2.

#### A. Data Adjustments

The COLA index is based on a Bureau of Labor Statistics index of Urban Family Budgets (labeled BLS in Table 1, Panel A). The BLS index is not available for the two restrictive SMSAs: the 45 observations of adjusted price (ADJPRICE) and income per capita (ADJYPC) are, in essence, missing values for these cities. The FTC extrapolate these observations with an index based on a cross-sectional multiple regression model ( $N = 39$ ,  $R^2 = .71$ ). The linear model, reported in Bond et al. (1980, pp. 91-93), has three explanatory variables:

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<sup>3</sup> Kwoka reports 147 observations across seven cities, though one additional observation is present for a subject who had only one visit (which is retained for this re-evaluation); for two cities classified as restrictive and nonrestrictive by the FTC, no observations are present.

<sup>4</sup> American Chamber of Commerce Research Association, Intercity Cost of Living Indicators, First Quarter, 1977; the ACCRA index can not be used to substitute for the COLA index since it is not available for many of the SMSAs surveyed.

BLS = f (1975 population per square mile; 1970 percentage of families living below the poverty level; total local taxes per capita based upon local government tax data in 1971-72 for the 1970 population).

Among the 21 cities/observations with BLS indexes less than 100, two cities have predicated indexes which deviate by more than five percentage points from the BLS index. Substantial deviation can also be noted by comparing the COLA index with the ACCRA index published by the American Chamber of Commerce Research Association.<sup>4</sup> The FTC COLA index and the ACCRA index place the same value of 100 for the cities of Seattle, Washington, and Little Rock, Arkansas, respectively (SMSAs surveyed by the FTC but not included in this subsample). The ACCRA index also gives the value of 94.6 to Knoxville, Tennessee. However, the COLA index extrapolates the value of 85 to both Knoxville and Little Rock -- deviations from the ACCRA index of 9.6 and 15 percentage points respectively, or deviations from the Seattle COLA index of 15 percentage points for both markets. The impact of such wide deviations is to inflate prices dramatically in restrictive markets and in particular, Knoxville, as seen in Table 1, Panel A for the variable ADJPRICE. Mark Pauly and Kathryn Langwell (1983, p. 144) further note that SMSAs are often too large, "but sometimes too small", to represent the economic market area for a medical establishment (e.g., hospital). Within one SMSA in North Carolina (studied by the 1977 FTC survey), for example, the ACCRA index places a value of 104.9 for one city (Greensboro) and 99.8 for another (Winston-Salem). Finally, the Bureau of Labor Statistics has called into question the validity of the underlying Urban Family Budget index because the market baskets and consumption weights were not identical across SMSAs (see Mark Sherwood, 1975). Given the uncertain validity of the COLA index, the unmeasured errors which are present in the creation of the actual BLS index itself and the FTC extrapolated index, and the complex nature of regional medical price variation, it is appropriate to investigate the sensitivity of the FTC data to the extrapolated cost of living adjustments. Such an investigation is also justified given the design collinearity shown in Table 1: estimated cost of living is collinear with level of restrictiveness (e.g. only low cost-of-living SMSAs were sampled to measure restrictive markets; high cost of living is associated with unrestricted markets).

The comparison of pooled transaction prices (not adjusted for quality) is performed in the "Base Model" using two economic factors: YPC and ODPC. A close examination of these two factors reveals additional design collinearities. Income per capita

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<sup>4</sup> American Chamber of Commerce Research Association, Intercity Cost of Living Indicators, First Quarter, 1977; the ACCRA index can not be used to substitute for the COLA index since it is not available for many of the SMSAs surveyed.

(YPC) adjusted by COLA (ADJYPC) has been used to control for local demand conditions. Table 1, Panel A indicates an apparent experimental design correlation between the level of restriction and ADJYPC; lower incomes correspond to more restrictiveness. The simple correlation between income per capita and an optometric practice being sampled in a restrictive market is .52 (significant at  $\alpha < .0001$ ). Kwoka notes that ADJYPC is not generally statistically significant though positive in sign (as reported in Table 2). A more serious design collinearity is between optometrists per capita (ODPC) and a practice being sampled in a restrictive market (the simple correlation of .78 is significant at  $\alpha < .0001$ ). ODPC is used to control the "intensity of monopolistic competition." Citing Benham and Benham, Kwoka (p. 213) states, "There is reason to believe that the number of optometrists per capita may be greater where advertising exists. If so, present estimates understate the full effect of advertising." As shown in Table 1, Panel A, however, the restrictive markets under study have on average almost twice the number of optometrists per capita than nonrestrictive markets and can therefore be considered more competitive. No markets are sampled that have low optometrists per capita and an absence of advertising and chain firms. In the base model reported in Table 2, the negative parameter estimate for ODPC reveals an apparent contradiction in the SMSAs studied. Clearly, the effect of advertising restrictiveness is confounded with ODPC. An additional danger of including ODPC in the regression models is that it may control for possible endogenous effects of advertising restrictions (i.e. the increase in optometric practices per capita, or an increase in competition, as stated in Kwoka). Given the underlying values for YPC and ADJYPC, ADJYPC's lack of statistical significance, the questionable nature of COLA, and the design collinearities, a sensitivity analysis of the data adjustments appears justified. The investigation of nested alternatives, as commonly suggested, is proposed to unravel the effects of the adjusting variables and control/design collinearities.<sup>5</sup>

#### B. Examination Prices (not adjusted for quality)

Table 2 illustrates the sensitivities of the adjustments discussed above, in comparison with the Base Model; in all the regressions, the comparison group of all optometrists in the restrictive SMSAs is reflected in the constant term. The regressions reported in Table 2 call into question conclusion C1 which states that nonadvertisers are forced to lower prices to compete in markets where advertisers and chain-firms are present (based on the value of NONE = -2.59,  $\alpha = .05$  in the Base Model). Models (b) to (f) in Table 2 demonstrate that the significance of this result is completely dependent on the inclusion of the adjusting variables. In particular, after one eliminates the collinearity introduced by ODPC, one observes a sign change at significant levels for the prices

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<sup>5</sup> See George Judge et al. (1980)

charged by nonadvertisers in nonrestrictive markets; these practices may actually increase price by some \$2.00 to over \$6.00 per examination over optometrists in restrictive markets. A similar sign change at significant levels occurs when one eliminates only the FTC COLA index from the Base Model. Though not correcting for the design collinearity, if price is measured in per capita terms (as a proxy for cost-of-living differences), there is no significant difference between non-advertisers across markets (see Model (g), Table 2). The difference between advertisers and nonadvertisers in nonrestrictive markets reduces to some \$1.61 for SMED and \$3.03 for LMED from \$11.13 and \$12.35 reported in Kwoka, respectively, depending on the model adjustments. Likewise, the reduction of price by in-store advertisers, estimated in the Base Model (STORE = -7.56,  $\alpha < .01$ ), is no longer statistically significant across the alternative models; it should be noted that the FTC data base has a sample of only 4 observations for these optometrists. In contrast to C1 this re-evaluation leads to plausible alternative conclusions (stated as such while considering the limited sample sizes of the FTC data base):

- AC1: Nonadvertisers in nonrestrictive markets do not decrease, and may even increase, prices (not adjusted for quality) in the face of competition from advertisers and chain firms; the conclusion that nonadvertisers in nonrestrictive markets decrease prices in the face of competition is a function of data adjustments, the uses of which are of questionable validity.
- AC2: There is insufficient evidence to conclude that in-store advertisers (N=4) and nonadvertisers in nonrestrictive markets charge less than nonadvertisers in restrictive markets.

Combined, AC1 and AC2 prevent one from finding that advertising deregulation will result in price declines across all types of optometric practices. Ignoring patient volumes but considering the lack of random sampling across cells, the frequency weights reported in Kwoka and the practice coefficients in models (b), (c), (d), (e) and (f) imply the plausible conclusion that prevailing prices are, on average, higher in non-restrictive markets, than restrictive markets (from less than \$.20 to over \$3.50); as opposed to a price decrease of some \$5 reported in Kwoka, or derived from the Base Model.

### C. Examination Quality by Practitioner Type

Conclusion C2 states the mean time spent for examinations (quality) in pre-Bates advertising markets is actually longer [in nonrestrictive markets] than in pre-Bates restrictive markets. This conclusion is based on two elements:

- time of examinations across practitioner types, and
- averages across practitioners within markets based on frequency weights.

Table 2 addresses the first element by showing that the elimination of the statistically insignificant adjusting variables can affect the estimates of examination time differences. From Models (h) and (i), the statistical significance of NONE varies between  $\alpha = .01$  and  $\alpha = .12$ . STORE is not significant across the models. Within non-restrictive markets, nonadvertisers provide examinations which are some 15 minutes more lengthy than nonadvertisers and chain firms ( $\alpha < .01$ ); nonadvertisers in nonrestrictive markets provide examinations that are some 10 minutes more lengthy than chains and advertisers ( $\alpha < .01$ ), as opposed to 5 minutes reported in Kwoka.

Models (j) and (k) show that the conclusion that nonadvertisers have higher quality in nonrestrictive markets than their counterparts in restrictive markets is also sensitive to the definition of quality. An alternative measure of quality which is both objective and observable is the medical adequacy of the examination. In Models (j) and (k) the dependent variables  $ADQTIME \geq 15$  and  $ADQTIME \geq 20$  are dummy variables which indicate whether sample examinations lasted 15 minutes or more and 20 minutes or more, respectively. The medical opinions of optometrists consulting to the FTC, and optometrists representing advertisers concur that a complete basic eye examination should last no less than twenty minutes, and that examinations lasting less than 15 minutes cannot be medically adequate, or meet minimum State medical requirements, as a number of critical procedures will not be included (e.g. medical history evaluation, ophthalmoscopy); rapid examinations generally involve patient refraction only.<sup>6</sup> Using the more conservative indicator of 15 minutes or more, Table 1, Panel B indicates that approximately 40 to 50 percent of chain firms and media advertisers provide inadequate examinations, compared with 6 and 9 percent for nonadvertisers in nonrestrictive and restrictive markets, respectively. Table 2, models (j) and (k), reports that the difference between advertisers and nonadvertisers in restrictive markets is statistically significant ( $\alpha < .01$ ). Contrary to Kwoka, the differences among nonadvertisers are not significant across competitive environments (no adjustments are made to the data given that this is a test for minimum requirements); a similar finding is reached if one uses even more conservative measures of time-adequacy (e.g. 5 or 10 minutes).

#### D. Quality Across Regulatory Environments

The second element in Conclusion C2 is the use of weights to derive average market quality. This becomes necessary because nonrandom samples were collected within each

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<sup>6</sup> This criteria of "adequate quality is based on the unanimous opinion of the Doctors of Optometry who consulted to the FTC and optometrists representing chain optical firms during public hearings before the FTC; Dr. Barry Davis and Dr. Richard Zaback (NAOO Panel I-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.

nonrestrictive SMSA due to the low number of chain firms present in 1977. Frequency of establishment types were determined based on Yellow-Page listings and newspaper advertisements observed over a seven month period. As Kwoka (p. 215) notes, however, using frequencies does not reflect the likely larger share of chain firms. Weights based on the frequencies observed by the FTC survey implies market shares in nonrestrictive markets of 9.5 percent for chain firms (LMED), 19.1 percent for small media advertisers (SMED), and 71.5 percent for onsite advertisers and nonadvertisers.<sup>7</sup> In comparison to the frequency weights, chain firms employed 8.6 percent of optometrists and garnered 33.3 percent of optometric industry sales in 1976. These shares have gradually grown to 18.9 percent of employment and 53.7 percent of sales, respectively, in 1987; private optometrists' shares have fallen to 81.1 and 46.3 percent respectively. After the Bates decision and nationwide advertising deregulation, the percentage of optometrists who advertise has increased from 26 percent in 1981 to 46.3 percent in 1986, to 73 percent in 1988 (as opposed to 28.6 percent used in Kwoka). These post-Bates changes are consistent with pre-Bates conclusions drawn by Benham (1972), who finds that firms/clinics ("likely to represent larger commercial firms") had up to 76 percent share where advertising was not restricted and as little as 7.7 percent share where advertising was prohibited. In contrast to C2 one can submit the following plausible alternative conclusions:

- AC5: Pre-Bates advertisers' and chain firms' examinations are from 10 to 15 minutes shorter than nonadvertisers' in restrictive and nonrestrictive markets respectively; the lower quality of examinations translates into some 40 to 50 percent of examinations offered by chain firms and advertisers being medically inadequate.
- AC6: The difference in length of examinations between pre-Bates nonadvertisers in restrictive and nonrestrictive markets is marginally significant; the proportion of medically inadequate examinations is not statistically different across restrictive and nonrestrictive markets for nonadvertisers.
- AC7: Conservatively assuming that advertisers and chain firms garner a 50 percent share in markets where they exist (25 percent each), the percentage of inadequate examinations has grown from 9 percent in pre-Bates environments to 26 percent in post-Bates environments.
- AC8: Using Time as a measure of quality, average time spent per examination in restrictive markets is higher than in nonrestrictive markets, if (1) the quality across nonadvertisers is considered insignificant and one uses any aggregation method (number of establishments or shares) or (2) the quality of nonadvertisers is considered marginally higher in unrestricted markets, and one uses market shares to aggregate quality (as opposed to number of establishments).

Alternative conclusion AC8 and model (i) implies quality declines ranging from 3.1

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<sup>7</sup> These weights are reported for all four of the least restrictive SMSAs by Ronald S. Bond in a letter to the FTC (James P. Greenan) on May 29, 1985.

minutes using frequency weights, to over 5.4 minutes using shares, as opposed to an increase in quality of 5.3 minutes reported in Kwoka. If one believes that the difference in nonadvertisers' quality is significant across regulatory environment, frequency weights applied to model (i) imply an increase of TIME per examination of less than 5 seconds; if shares are applied, quality declines by 3.3 minutes.

#### E. Prices Adjusted for Quality

Given the heterogeneity in eye examination quality across practitioners, it is appropriate to examine differences in prices adjusted for quality. Kwoka approaches this issue by regressing price (ADJPRICE) against quality (TIME), quality interacting with advertising markets, the adjusting variables (ODPC, ADJYPC) and the type of optometrist (NONE, STORE, SMED, LMED). Given that quality, price and level of advertising are endogenous, as noted in Kwoka, an alternative is to use quality-adjusted price as the dependent variable. The advantage of this approach is that it provides a direct measure of markup behavior 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 and ADJPRICE/TIME are reported in Table 1, Panel B. Table 3, models (s) and (t), shows that labor markups of chain firms are significantly higher than those of nonadvertising optometrists in restrictive markets – 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 inadequate. If one were to consider paying for an examination not meeting minimum 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. This result is found for both COLA adjusted and unadjusted prices, though significance declines in the former case. Design collinearity introduced by ODPC and YPC results in insignificant estimates across practitioners. Examination of the underlying cell means reported in Table 1 indicates that within restrictive markets, advertisers and chain firms charge more per minute than nonadvertisers (significant at  $\alpha = .01$ ). In contrast to conclusions C3 and regardless of the aggregation method employed to weight practitioner types, this analysis supports the following plausible alternative conclusion:

AC9: Quality adjusted prices are higher in pre-Bates markets where advertising and chain firms were present.

Price per minute of examination time is higher in nonrestrictive markets by some \$.13 to

\$.30 depending on the aggregation scheme, or the use of cost-of-living adjustments.

### III. Discussion

In answering the question of whether there is evidence that a market of lemons is occurring in optometry, Kwoka (p. 216) finds that deregulation will result in a lowering of prices without an erosion of quality. This conclusion is based on a study having confounded design effects, which are revealed in key coefficients whose signs change at significant levels when these effects are considered. We find that deregulation may in fact increase transaction prices for high quality care provided by nonadvertisers, and will gradually drive high quality care from the market; consumers will likely end up paying more for care on a quality-adjusted basis. While the FTC sample is too small to prove a case supporting regulation, this re-evaluation demonstrates that the data do not clearly support a case for deregulation as previously suggested. John Rizzo and Richard Zeckhauser (1990, pp. 497-8) find in an empirical study of physicians that "the FTC's strong interventions in favor 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." A similar consideration of long run effects appears justified for the optometric industry, especially in light of certain industry surveys which find that traditional chain firms and superoptical chain firms began charging higher prices and mark-ups than private optometrists during the late 1980s.<sup>8</sup> Such findings, if validated, are interesting given that this industry has three institutions which George Akerlof claims will arise to counteract the effects of quality uncertainty: brand names, commercial chains, and licensing.

The negative correlation between quality and advertising (low quality providers advertise the most), the positive relationship between advertising and price (quality adjusted) and the inverse relationship between optometrist per capita and the degree of market regulation would suggest that substantial information asymmetry exists in the market for optometric services (William Comanor and Thomas Wilson, 1979; Michael Darby and Edi Karni, 1973; Richard Schmalensee, 1978); such asymmetry may be a reason for the failure of counteracting institutions. Consistent with the long standing belief that information asymmetry exists in the medical services industry (Kenneth Arrow, 1963), Bond et al. (p. 87), warns that the low explained variance in their analysis of the FTC data may be consistent with the view that consumer misinformation plays an important role in optometric markets, and Kwoka (p. 215) also warns that residual imperfections in

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<sup>8</sup> See 20/20, December 1986, pp. 42-48; and Bennette (1988)

consumer information, in addition to unmeasured quality differences, may explain cross-practitioner quality-constant price differences.

The FTC collected data on the trained subjects' opinions of the optometric establishments surveyed in 1977 which can be used to directly investigate the role of consumer misinformation. The FTC subjects were asked: "Would you send a member of your family or a personal friend to this office for an eye health examination?" Subjects answered "yes" in 52.1 percent ( $n = 140$ ) of the cases for nonchain practices and 15.9 percent ( $n = 63$ ) for chain firms.<sup>9</sup> Assuming that trained subjects are "fully informed" and that affirmative answers can be translated into purchase outcomes, chain firms and small-firm advertisers would garner 23.4 percent in markets with full information, while nonadvertisers would garner 76.6 percent. As noted above, 73 percent of optometrists advertised in 1988 and chain firms alone had 53.7 percent of industry sales in 1987. The difference between the hypothetical and actual shares cited demonstrates the extent to which this industry may be subject to a lemons process.<sup>10</sup>

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<sup>9</sup> Subjects were also asked if they would send a member of their families or personal friend to the office for vision testing for an Rx; hypothetical shares based on this question are 70.3 percent for nonchains and 28.6 percent for chains; differences are statistically significant at the 95 percent level for the two-tailed test; in-store advertisers are included in nonchain practices.

<sup>10</sup> The focus here on tests of mean differences is consistent with the literature; equilibria associated with perceptions of variance differences may merit further attention.

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Table 1. 1977 FTC Study

Panel A: Sample Sizes, Dependent and Independent Variable Means, and Cost-of-Living Adjustments (COLA)

Presence of Advert.: SMSA	PRICE (ADJPRICE) <sup>a</sup>				TIME <sup>a</sup>				YPC				SAMPLE SIZE			
	NONE	STORE	SMED	LMED	NONE	STORE	SMED	LMED	DOPC	(ADJYPC)	BLS	COLA	NONE	STORE	SMED	LMED
1. No Advert. Knoxville	22.65 (26.64)	----- (-----)	----- (-----)	----- (-----)	25.30	-----	-----	-----	66.6	4201 (4951)	N/A	85	17	(-----)	(-----)	( )
2. No Advert. Providence	18.17 (18.73)	----- (-----)	----- (-----)	----- (-----)	26.80	-----	-----	-----	140.7	4550 (4691)	N/A	97	29	(-----)	(-----)	(-----)
Aggregate	19.83 (21.65)	----- (-----)	----- (-----)	----- (-----)	26.25	-----	-----	-----	103.7	4375.5 (4821)	N/A	91	46	(-----)	(-----)	(-----)
3. Advertising Baltimore	26.52 (26.26)	25.00 (24.75)	16.88 (16.72)	15.73 (15.57)	33.40	20.00	11.30	14.00	44.4	5001 (4951)	101	98	19	1	9	11
4. Advertising Washington	26.35 (25.10)	19.67 (18.73)	17.40 (16.57)	14.86 (14.14)	26.5	16.00	17.20	11.30	65.9	6404 (6099)	105	106	17	3	10	7
5. Advertising Minneapolis	25.29 (24.32)	----- (-----)	18.50 (17.79)	17.75 (17.06)	31.90	-----	21.30	20.40	58.7	5206 (5006)	104	102	13	(-----)	4	8
Aggregate	26.13 (25.34)	21.00 (20.24)	17.39 (16.84)	16.12 (15.64)	30.61	17.00	15.60	15.24	55.3	5537 (5352)	103	102	49	4	23	26

Panel B: Additional Variable Means and Sample Sizes

Presence of Advert.: SMSA	ADQTIME <sub>X</sub> ≥ 15 min. (cases) <sup>a</sup>				PRICE/TIME (ADJPRICE/TIME) <sup>a</sup>				FRAMES: MARKUP (ADJMARKUP)				FRAMES: Sample Size			
	NONE	STORE	SMED	LMED	NONE	STORE	SMED	LMED	NONE	STORE	SMED	LMED	NONE	STORE	SMED	LMED
1. No Advert. Knoxville	0.94 (16)	----- (-----)	----- (-----)	----- (-----)	1.03 (1.21)	----- (-----)	----- (-----)	----- (-----)	2.19 (2.58)	----- (-----)	----- (-----)	----- (-----)	12	-----	-----	-----
2. No Advert. Providence	0.90 (26)	----- (-----)	----- (-----)	----- (-----)	.83 (0.86)	----- (-----)	----- (-----)	----- (-----)	1.91 (1.97)	----- (-----)	----- (-----)	----- (-----)	7	-----	-----	-----
Aggregate	0.91 (42)	----- (-----)	----- (-----)	----- (-----)	0.90 (0.99)	----- (-----)	----- (-----)	----- (-----)	2.09 (2.36)	----- (-----)	----- (-----)	----- (-----)	19	-----	-----	-----
3. Advertising Baltimore	0.95 (18)	1.00 (1)	0.22 (2)	0.45 (5)	.99 (0.97)	1.25 (1.24)	1.58 (1.56)	1.32 (1.31)	2.01 (1.99)	2.12 (2.09)	2.47 (2.44)	3.10 (3.07)	11	3	4	1
4. Advertising Washington	0.88 (15)	0.66 (2)	0.60 (6)	0.29 (2)	1.27 (1.21)	1.72 (1.63)	1.18 (1.12)	1.39 (1.33)	2.00 (1.90)	2.35 (2.24)	2.75 (2.64)	3.13 (2.98)	3	2	4	1
5. Advertising Minneapolis	1.00 (13)	----- (-----)	0.75 (3)	1.00 (8)	.90 (0.86)	----- (-----)	1.06 (1.02)	0.93 (0.90)	1.76 (1.70)	1.74 (1.67)	1.74 (1.67)	1.79 (1.72)	6	2	1	5
Aggregate	0.94 (46)	0.75 (3)	0.48 (11)	0.58 (15)	1.06 (1.02)	1.60 (1.53)	1.32 (1.27)	1.22 (1.19)	1.93 (1.89)	2.08 (2.01)	2.51 (2.44)	2.17 (2.09)	20	7	9	7

a. Sample sizes are reported in Panel A.

Table 2. Regression Sensitivities for Price and Quality of Optometric Services (Significance levels in parentheses).<sup>a</sup>

Model	Dependent Variable	Constant	NONE	STORE	SMED	LMED	ODPC	ADJYPC	R <sub>a</sub> <sup>2</sup>	F	
Kwoka (Base Model)	ADJPRICE	28.92 (0.00)	-2.59 (0.05)	-7.56 (0.00)	-11.13 (0.00)	-12.35 (0.00)	-9.88 (0.00)	8.24 (0.28)	.54	29.4	
	(a) ADJPRICE	32.52 (0.00)	-1.95 (0.10)	-6.55 (0.00)	-10.40 (0.00)	-11.76 (0.00)	-9.58 (0.00)	----- (-----)	.54	35.3	
	(b) ADJPRICE	22.26 (0.00)	3.76 (0.00)	-1.29 (0.60)	-4.73 (0.00)	-5.95 (0.00)	----- (-----)	-1.25 (0.88)	.40	20.8	
	(c) ADJPRICE	21.66 (0.00)	3.61 (0.00)	-1.42 (0.54)	-4.82 (0.00)	-6.01 (0.00)	----- (-----)	----- (-----)	.41	26.2	
	(d) PRICE	23.20 (0.00)	2.80 (0.03)	-2.30 (0.33)	-5.97 (0.00)	-7.23 (0.00)	-5.40 (0.00)	5.72 (0.43)	.52	27.3	
	(e) PRICE	25.69 (0.00)	3.23 (0.00)	-1.60 (0.46)	-5.45 (0.00)	-6.81 (0.00)	-5.17 (0.00)	----- (-----)	.52	27.3	
	(f) PRICE	19.83 (0.00)	6.31 (0.00)	1.17 (0.58)	-2.43 (0.02)	-3.71 (0.00)	----- (-----)	----- (-----)	.48	34.9	
	(g) PRICE/YPC <sup>a</sup>	45.10 (0.00)	2.81 (0.14)	-9.57 (0.05)	-13.89 (0.00)	-15.06 (0.00)	----- (-----)	----- (-----)	.39	19.9	
	Kwoka (Base Model)	TIME <sup>a</sup>	49.53 (0.00)	7.55 (0.03)	-4.23 (0.50)	-6.92 (0.07)	-8.09 (0.03)	2.49 (0.54)	-32.33 (0.10)	.40	7.4
	(h) TIME <sup>a</sup>	35.79 (0.00)	4.94 (0.12)	-8.01 (0.17)	-9.87 (0.00)	-10.43 (0.00)	1.11 (0.77)	----- (-----)	.33	7.1	
	(i) TIME <sup>a</sup>	37.04 (0.00)	4.30 (0.05)	-8.56 (0.13)	-10.50 (0.00)	-11.08 (0.00)	----- (-----)	----- (-----)	.34	7.7	
	(j) ADQTIME > 15 <sup>b</sup>	2.35 (0.00)	0.38 (0.63)	-1.25 (0.32)	-2.44 (0.00)	-2.04 (0.00)	----- (-----)	----- (-----)	-----	-----	
	(k) ADQTIME > 20 <sup>b</sup>	1.04 (0.00)	0.75 (0.16)	-1.04 (0.32)	-2.32 (0.00)	-1.85 (0.00)	----- (-----)	----- (-----)	-----	-----	
(l) PRICE/TIME <sup>c</sup>	0.45 (0.00)	0.18 (0.14)	0.77 (0.01)	0.44 (0.00)	0.40 (0.00)	----- (-----)	----- (-----)	.14	3.2		
(m) ADJPRICE/TIME <sup>c</sup>	0.54 (0.00)	0.06 (0.65)	0.62 (0.05)	0.31 (0.04)	0.27 (0.06)	----- (-----)	----- (-----)	.11	2.7		

a. All estimates are generated using OLS; generalized leastsquares estimation provides similar estimates, though price differences among practitioners is reduced, as reported by Kwoka (p. 214); OLS estimates tend, therefore, to favor the hypothesis that chain firms and advertisers charge lower prices; parameter estimates in model g are 10,000 times the original estimates; models with TIME as a dependent variable are adjusted for subject dummies.

b. Probit estimates are reported; the results are insensitive across logistic, probit, or OLS estimation procedures.

c. Parameters for STORE, SMED and LMED are not statistically significant when ODPC, YPC or ADJPRICE are introduced; Adjusted for subject dummies; OLS estimation.

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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	Jae Won PARK	"Changing Uncertainty and the Time-Varying Risk Premia 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	Jae 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 Tyge 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 Tyge 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 Tyge 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 Nitín 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 Minding the Store?" Revised, December 1990
90/77 MKT	Wilfried VANHONACKER	"Testing the Koyck 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	1991		
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 Paul VAN BEEK	"Operational Research Can Do More for Managers Than They Think!," January 1991
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, Danny 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	"Lending 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 CATTRYSSSE, Roelof KUIK, Marc SALOMON and Luk VAN WASSENHOVE	"Heuristics for the Discrete Lotsizing and Scheduling Problem with Setup Times", March 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			