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STRATEGIC REGULATORY ENTRY DETERRENCE

An Empirical Test in the Ophthalmic Market

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This paper provides an empirical test of the theory of strategic regulatory entry deterrence – the theory that subgroups of firms within an industry will use the regulatory process to increase rivals' costs and thereby deter rivals' entry. The results suggest that the commercial practice restrictions present in the ophthalmic industry deterred chain optical firms' entry into the market. This result in combination with earlier findings that the restrictions increase optometrists' prices suggests that cost-raising strategies can be used to disadvantage rivals or drive them out of the market without the need to lower price.

1. Introduction

Barriers to entry and the rate of entry into a market play very important roles in economic theory. As a result, there has been very lively debate on the issues of what constitutes an entry barrier [Bain (1968), Stigler (1968) and Demsetz (1982)], the extent to which potential entrants (as opposed to actual entrants) can generate competitive outcomes [Bain (1968), Baumol, Panzar and Willig (1982), Shepard (1984) and Morrison and Winston (1987)], and the extent to which incumbent firms can disadvantage potential entrants through strategic use of entry barriers [Salop and Scheffman (1983, 1987), Oster (1982) and McCormick (1984)]. However, despite the interest in entry and entry barriers, there has been very little empirical study of the determinants of entry.[1]

With respect to the issue of potential entrants generating competitive outcomes, proponents of contestable market theory hypothesize that in markets characterized by free entry and costless exit a positive rate of entry

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[1]Hause and Du Rietz (1984) wrote, 'Recognition of the central role of entry in the theory of supply is at least as old as Adam. Oddly enough, the subsequent theoretical and empirical elaboration of entry has been like *Moby Dick* without the whale' (pp. 733–734).

is not necessary for generating competitive outcomes. Rather, they suggest that a pool of potential entrants is sufficient. If there are potential entrants, then an entrant could 'go in, and before prices change, collect his gains and then depart without cost, should the climate grow hostile' [Baumol (1982, p. 4)]. Given the assumptions of perfectly contestable markets, this hypothesis depends on the sensitivity of potential entrants to changes in the costs and returns of entry, however, little empirical evidence exists on the sensitivity of entrants to variations in the costs and returns to entry.

With respect to the issue of strategic use of entry barriers to disadvantage entrants by raising their costs, it is hypothesized that in an industry with heterogeneous firms, one firm or one group of firms might promote an exclusionary strategy that imposes cost on all firms, if those costs are not imposed symmetrically. Salop and Scheffman (1983, 1987) develop a model in which cost-raising strategies can be profitable whether or not the rivals exit the market. However, sufficient increases in average costs can cause some fringe firms to exit the industry and others to forego entry.

This paper provides a test of the empirical importance of entry deterrence based on a strategy of raising rivals' costs by government regulation. Further, this paper provides estimates of the sensitivity of entrants to variations in the costs and return of entry. An empirical model, similar to the model used by Hause and Du Rietz (1984), that assumes entry by subgroups of firms within an industry is a function of the incentivs to enter the industry relative to subgroup specific entry barriers is developed and then estimated. In particular, the hypothesis that the state commercial practice restrictions present in the ophthalmic industry deter entry by non-professional chain optical firms[2] is tested.

Previous research on the effects of commercial practice restrictions in the market for ophthalmic services has focused on the restrictions' effects on the price and quality of optometrists' services [Benham (1972), Benham and Benham (1975), Feldman and Begun (1978), FTC (1980), Kwoka (1984) and Haas-Wilson (1986)]. These studies have demonstrated that optometrists' prices are significantly higher, while quality is not significantly different in states that restrict optometrists' advertising, employment, and other business practices. Prices may be higher due to the entry deterring effects of these restrictions or prices may be higher because the restrictions prevent firms from realizing economies of scale or scope. Previous studies have not been able to test this hypothesis because of lack of data on the number and location of chain optical firms. This study, using a new data set that includes 15 years of information on the number and location of chain stores by state,

[2]Non-professional optical firms differ from professional optical firms in that professional corporation law requires that each stockholder of a professional corporation be a licensed member of the profession for which the corporation is organized to practice [Coblens (1976)].

analyzes the extent to which these cost-raising strategies have deterred entry into the ophthalmic market.

The extent to which professional regulations on business structure and practices can be used to raise rivals' costs and deter entry has important policy implications for many professions in many countries. For example, Belgium and Ireland prohibit corporate practice by professionals. Greece prohibits corporate practice by professionals, with the exception of architects. Japan prohibits attorneys from practicing in more than one office, but allows physicians to form corporations. Denmark prohibits lawyers and physicians from practicing in more than one office.[3]

2. Strategic regulatory entry deterrence in the ophthalmic industry

The strategic regulatory deterrence hypothesis applied to the ophthalmic industry consists of two propositions. First, self-employed optometrists seek and obtain regulations intended to constrain the operations of their commercial rivals. Second, these regulations succeed in their intent and thereby deter new commercial entry. While the first proposition is not directly tested in this paper, there is general consensus that the commercial practice restrictions are designed to keep chain optical firms out of the market. For example, in a 1980 Federal Trade Commission report it is stated that commercial practice restrictions 'are intended primarily to restrict the growth of high volume "chain" vision care outlets' (p. vii) and 'The goal of restrictions on commercial practice generally is the elimination of chain or volume practices' (p. 9).[4]

However, despite the intent of the commercial practice restrictions, the market share of chain optical firms is increasing. The largest retailer of ophthalmic goods, Pearle Health Services, operated or franchised 24 retail optical stores in 6 states in 1970 and, by 1985, operated or franchised 1,074 retail optical stores in 44 states and the District of Columbia.[5] The second largest optical retailer, Cole National Corporation, entered the market in the mid-1960s and, by 1985, operated 544 Sears and Montgomery Ward optical departments in 37 states and the District of Columbia.[6] Thus, this paper provides a test of the second part of the strategic regulatory entry deterrence hypothesis – that the commercial practice restrictions deter entry by one subgroup of firms in the ophthalmic industry, chain optical firms.

State-by-state self-regulation of optometrists has resulted in wide cross-

[3]Organization for Economic Cooperation and Development (1985), pp. 70–71.

[4]Further, strategic use of regulatory process is quite possible in the ophthalmic industry because optometrists regulate themselves and self-employed optometrists have better access to the regulatory process than lay-employed optometrists.

[5]Data provided by Pearle Health Services, Inc.

[6]Data provided by Cole National Corporation.

sectional variation in the type of commercial practice restrictions placed on optometrists. In 1980 the employment of optometrists by non-professional firms was restricted in 37 states, the permissible locations of optometrists' offices were restricted in 28 states, the number of branch offices per optometrist was restricted in 22 states, and the use of trade names by lay-employed optometrists was restricted in 38 states.[7] And prior to 1978, the year of the Bates decision[8] and the Federal Trade Commission trade regulation rule (16 CFR Part 456) eliminating bans on truthful advertising, many states restricted advertising of ophthalmic goods and services. In 1975 advertising of discounts or premiums by optometrists was prohibited in 35 states.[9]

Employment restrictions prohibit the employment of optometrists by unlicensed persons or firms, and thereby prevent nonprofessional firms from selling eye examinations and eyeglass or contact lens prescriptions (i.e. offering the one-stop service of dispensing optometrists).[10] To the extent there are economies of scope in the joint production of eye examinations and eyeglasses or contact lenses, the employment restriction forces non-professional optical firms to incur the higher cost of producing eyeglasses and contact lenses alone. The National Association of Optometrists and Opticians (NAOO) estimated that 'state laws which force optometrists and vision care firms to practice in a side-by-side configuration increase the construction cost of such offices as much as $20,000 per office and the operating cost at least another $10,000 per office every year' (NAOO 1985, p. ii).

Trade name restrictions usually provide that an optometrist's license may be revoked or suspended for practicing under a name other than one's own name or under a false or assumed name; however, trade name restrictions generally do not prohibit an optometrist from working for another optometrist and practicing under the name of the professional corporation. Thus optometrists employed by professional optical firms can use trade names in their advertising, while optometrists employed by nonprofessional optical firms cannot. Since consumers may use trade names as substitutes for search or as an aid in processing information about different sellers, the trade name restriction reduces the ability of non-professional optical firms to attract new customers and realize scale economies.

State restrictions on the permissible locations of optometrists' offices provide that it is unprofessional conduct or an illegal practice to work in an

[7]Federal Trade Commission (July 1980).

[8]Bates v. State Bar of Arizona, 433 U.S. 350 (1977).

[9]Federal Trade Commission (1977).

[10]Non-professional firms can hire opticians; however, opticians can only dispense eyeglasses and contact lenses from optometrists' or ophthalmologists' prescriptions.

office not devoted exclusively to the practice of optometry or other health care profession, or where materials are displayed pertaining to a commercial undertaking not related to the practice of optometry. Thus location restrictions prevent optometrists from locating in department and drug stores.

When optometrists make decisions about where to locate their practices within a state, they must weight the advantages of locating in a high visability location, such as a shopping mall, against the disadvantages of this sort of location. Advantages include the increased volume of patients due to wider exposure and the convenience offered to patients. Disadvantages include longer hours since most shopping mall leases contain a requirement that the leasee agree to maintain evening and weekend hours to comply with the mall's extended schedule.[11] Since most self-employed optometrists are in solo practice[12] the requirement for extended hours in a mall may impose a greater cost on self-employed optometrists than on lay-employed optometrists. Accordingly, in the absence of location restriction lay-employed optometrists may be more likely than self-employed optometrists to differentiate their services by locating in high-traffic, high-visibility areas, such as department stores, large pharmacies (Rite-Aid, Eckerds, Peoples, and Revco), shopping malls, and free-standing locations in proximity to shopping malls.[13] Thus, the location restriction will differentially damage chain optical firms and may deter their entry.

Branch office restrictions usually set a maximum number of branch offices an optometrist may operate or require the optometrist to be in personal attendance a certain percent of the time the office is open to the public. Thus the branch office restriction prevents optometrists from expanding their practices by opening new offices and restricts chain optical firms' ability to rotate optometrists between branch offices. To the extent lay-employed optometrists are more likely to practice in numerous locations, this restriction differentially damages chain optical firms and may deter their entry.

In summary two of the commercial practice restrictions, the employment and trade name restrictions, restrict the business practices of lay-employed optometrists. The advertising, location, and branch office restrictions restrict the business practices of both lay-employed and self-employed optometrists; however, since lay-employed optometrists are more likely to advertise, to locate in department stores and to practice in multiple locations, the advertising, location, and branch office restrictions may differentially damage

[11]Margaret Opsata, Guidelines to the study of shopping center locations, Dental Economics (Nov. 1982, p. 40).

[12]In 1982, 77 percent of self-employed optometrists were in solo practice [U.S. Department of Health and Human Services, Report to the President and Congress on the status of health personnel in the United States, Volume 2 (May 1984, p. B-4-1)].

[13]National Association of Optometrists and Opticians, before the Federal Trade Commission, Opthalmic Practice Rulemaking ('eyeglasses II'), submitted April 4, 1984, p. 45.

lay-employed optometrists. This suggests that all of the commercial practice restrictions may deter entry by lay-employed optometrists.

3. An empirical model of entry

Earlier empirical studies of the determinants of entry focused on determinants that varied over time, assuming homogeneous firms within industries [Pelzman (1965)], determinants that varied across industries, assuming homogeneous firms within industries [Mansfield (1962), Orr (1974), Duetsch (1975) and Hause and Du Rietz (1984)], and determinants that varied across industries, assuming heterogeneous firms [Gorecki (1975) and Hamilton (1985)]. The focus of this paper is on determinants of entry that vary across states, and therefore may explain differences in rates of entry by heterogeneous firms within an industry across states.

Entry into state$_j$ by firms in subgroup$_i$ is assumed to be a function of the expected returns to entry in state$_j$ relative to the costs of entry in state$_j$, measured as the level of entry barriers facing firms in subgroup$_i$ in state$_j$. In states where demand is growing rapidly, the expected returns to entry will be greater and thus attempts to deter entry into those states may be less effective. Hause and Du Rietz (1984) show that the rate of entry of new firms is an increasing convex function of the industry growth rate.

The expected returns to entry in state$_j$ also depend on whether potential entrants expect others to enter the state as well [Sherman and Willett (1967)]. The higher the expected probability of entry by other potential entrants into state$_j$, the lower the post-entry profits conjectured by each potential entrant in state$_j$.

Accordingly, the rate of entry of firms in subgroup$_i$ into state$_j$ $ENTRY_{ij}$ is assumed to be a function of the growth in demand in state$_j$ $DEMAND\ GROWTH_j$, the expectations of firms in subgroup$_i$ of the queue of other potential entrants into state$_j$ $POTENTIAL\ ENTRANTS_{ij}$, and the entry barriers facing firms in subgroup$_i$ in state$_j$ $BARRIERS_{ij}$.

$$ENTRY_{ij} = f(DEMAND\ GROWTH_j,\ POTENTIAL\ ENTRANTS_{ij},\ BARRIERS_{ij}). \tag{1}$$

The rate of growth in demand in state$_j$ is measured as the change in population in state$_j$ $\Delta POPULATION_j$ and the change in inflation-adjusted state per capita income $\Delta INCOME_j$. Increases in population or income will, ceteris paribus, increase demand for eyeglasses and contact lenses.[14]

The level of entry barriers facing firms in subgroup$_i$ in state$_j$ is measured as the presence of advertising and other commercial practice restrictions affecting firms in subgroup$_i$ in state$_j$. As discussed earlier, the advertising

[14]U.S. Department of Health and Human Services (February 1984) at fig. 9.

($R\text{-}PRICE\ ADVERTISE_j$ and $R\text{-}OPTICIAN\ ADVERTISE_j$)[15] and other commercial practice restrictions, such as the employment, trade name, branch office, and location restrictions ($R\text{-}EMPLOYMENT_j$, $R\text{-}TRADE\ NAMES_j$, $R\text{-}BRANCH\ OFFICE_j$, and $R\text{-}LOCATION_j$) may deter entry by chain optical firms.

The expectations of firms in subgroup$_i$ of the queue of other potential entrants into state$_j$ are included as the factors that make state$_j$ more or less attractive to potential entrants in other subgroups. The higher the entry barriers specific to firms in other subgroups, the shorter the expected queue of potential entrants from those subgroups. For example, the commercial practice restrictions in state$_j$ may decrease self-employed optometrists' expectations of entry by chain optical firms into state$_j$. The presence of a school of optometry $OPTOMETRY\ SCHOOL_j$ may make a state more attractive to optometrists [Yett and Sloan (1974)]. Likewise, the presence of a school of opticians in state$_j$ $OPTICIAN\ SCHOOL_j$ may make state$_j$ more attractive to opticians. Finally, state characteristics such as the percent of the population living in urban areas $\%URBAN_j$ [Yett and Sloan (1974)] and the percent of the population enrolled in institutions of higher education $\%HIGHER\ EDUCATION_j$ [Benham, Maurizi and Reder (1968)] may make one state more or less attractive to potential entrants.

4. The empirical results

Data on the number of stores operated in each state by Pearle Health Services, Cole National Corporation, and Sterling Optical Company (the three largest chain optical firms) between 1970 and 1985 are employed to estimate the effect of commercial practice restrictions on entry by chain optical firms. Entry by chain optical firms is measured as:

$$ENTRY_{jt} = E_{jt} - E_{j(t-1)},$$

where E_{jt} is the number of chain optical stores operated in the jth state in the tth year.[16]

Data on the number of self-employed optometrists by state are unavailable. So data on the total number of optometrists by state in 1970 and 1982 are used to estimate the effect of the commercial practice restrictions on entry by self-employed optometrists. During this time period less than 2 percent of active optometrists were employed by non-professional optical firms. The annual rate of entry by optometrists is measured as:

$$ENTRY_j = 1/12(OPT82_j - OPT70_j),$$

[15]Two advertising restrictions – restrictions on price advertising by optometrists and restrictions on advertising by opticians – are included.

[16]$ENTRY$ measures the net change in the number of businesses from year to year. This measure may understate the true entry rate to the extent that established businesses fail from year to year.

Table 1
Means and standard deviations of variables.[a]

Variable	Mean	Standard deviation	Source
ENTRY-CHAIN	2.08	4.49	Pearle, Cole, Sterling
ENTRY-OPTOM	8.00	12.91	DHSS (May 1984)
STORE	19.08	28.72	Pearle, Cole, Sterling
ΔPOPULATION	44.75	85.14	Statistical abstract
ΔINCOME	153.56	217.08	Statistical abstract
%HIGHER EDUCATION	0.05	0.02	Statistical abstract
%URBAN	63.18	23.50	Statistical abstract
OPTOMETRY SCHOOL	0.24	0.43	DHEW (1976)
OPTICIAN SCHOOL	0.37	0.49	DHEW (1976)
R-EMPLOYMENT	0.72	0.45	FTC (July 1980)
R-BRANCH OFFICE	0.43	0.50	FTC (July 1980)
R-LOCATION	0.55	0.50	FTC (July 1980)
R-TRADE NAMES	0.74	0.44	FTC (July 1980)
R-PRICE ADVERTISE	0.69	0.47	FTC (May 1977)
R-OPTICIAN ADVERTISE	0.49	0.50	FTC (January 1976)
CHAIN/POP-1985	0.01	0.004	Pearle, Cole, Sterling
OPTOM/POP-1970	8.97	2.45	DHSS (May 1984)
OPTOM/POP-1982	10.49	2.66	DHSS (May 1984)
OPTIC/POP-1969	5.66	2.85	DHEW (1972)
OPHTH/POP-1983	4.65	1.81	Ophthalmology (August 1983)

[a]$N=765$ for *ENTRY* through *METPOP* and $N=51$ for *OPTOSCH* through *OPHTH/POP-1983*.

where *OPT82* and *OPT70* are the number of optometrists practicing in the jth state in 1982 and 1970.

The data are further described in table 1.

Unbiased estimates are obtained from the pooled cross-section and time series data on chain optical firms using a covariance model [Wallace and Hussain (1969)].

$$
\begin{aligned}
ENTRY_{jt} = {} & a_0 + a_1 \Delta POPULATION_{jt} + a_2 \Delta INCOME_{jt} \\
& + a_3 \%HIGHER\ EDUCATION_{jt} + a_4 \%URBAN_{jt} \\
& + a_5 OPTOMETRY\ SCHOOL_j \\
& + a_6 OPTICIAN\ SCHOOL_j + a_7 R\text{-}EMPLOYMENT_j \\
& + a_8 R\text{-}BRANCH\ OFFICE_j + a_9 R\text{-}LOCATION_j \\
& + a_{10} R\text{-}TRADE\ NAMES_j + a_{11} R\text{-}PRICE\ ADVERTISE_j \\
& + a_{12} R\text{-}OPTICIAN\ ADVERTISE_j \\
& + \sum_{k=2}^{9} b_{kt} W_{kt} + \sum_{t=1971}^{1985} c_{jt} Z_{jt} + e_{jt}, \quad \text{where}
\end{aligned}
$$

$$W_{kt}=\begin{cases}1 & \text{for the } k\text{th region}\\ 0 & \text{otherwise,}\end{cases}$$

$$Z_{jt}=\begin{cases}1 & \text{for the } t\text{th year}\\ 0 & \text{otherwise.}\end{cases} \tag{2}$$

Eq. (2) is estimated in linear and linear-interactive form. In the first specification the advertising and other commercial practice restrictions are included as dummy variables that equal one if the restriction is present in the state and zero otherwise. In the second specification all six restrictions are included as dummy variables, and an index of the degree of state commercial practice regulation, *REG*, is interacted with the price advertising restriction. *REG* is constructed by summing *R-EMPLOYMENT*, *R-LOCATION*, *R-BRANCH OFFICE*, and *R-TRADE NAMES* by state. Thus the potential interaction between advertising restrictions and other commercial practice restrictions is included in the second specification. Further, the model is estimated using the number of established chain optical firms in state$_j$ in year$_t$, $STORE_{jt}$ as the dependent variable and the lagged dependent variable $STORE_{j(t-1)}$ as an independent variable.

The results reported in table 2 suggest that the commercial practice restrictions are effective in deterring entry by chain optical firms. Chain optical firms appear to enter states with commercial practice restrictions at a slower rate. Both the restriction on the employment of optometrists by non-professional firms and the restriction on price advertising by optometrists have negative and statistically significant effects on the entry rate of chain optical firms. Further, the total regulatory entry deterring effect, estimated as the sum of the coefficients on the six regulatory variables,[17] suggests that the three largest chain optical firms opened approximately 1.5 to 1.7 fewer new stores per year in fully regulated versus nonregulated states. The hypothesis that the total effect of the commercial practice restrictions is equal to zero can be rejected at the five and ten percent levels of significance ($F=2.17$ and 1.94 in columns A and B, respectively).[18] And consistent with these results, the results in column C suggest that the employment and price advertising restrictions have negative and statistically significant effects on the total number of chain optical stores by state.

[17]Maddala (1977), p. 189.

[18]The reported regressions are estimated using data from the 50 states and the District of Columbia and the FTC's classification of the regulations by state. As suggested by Terry S. Latanick, Vice President and Regulatory Counsel for Pearle Vision Center, the entry regressions were also estimated using data that excluded Alaska and Hawaii and reclassified the employment restriction. Estimation using 48 states and the District of Columbia and estimation using the Pearle Vision Center classification of the employment restriction gives similar results.

Table 2
Regressions on the entry rates of chain optical firms and optometrists (t-statistics are in parentheses).

	Chain optical firms[a] 1970–1985			Total optometrists 1970–1982	
	ENTRY	*ENTRY*	$STORE_t$		
	(A)	(B)	(C)	(D)	(E)
ΔPOPULATION	0.0189	0.0188	0.0151	0.1196	0.1197
	(8.44)	(8.37)	(6.38)	(4.44)	(4.38)
ΔINCOME	0.0003	0.0003	0.0002	−0.0167	0.0170
	(0.45)	(0.44)	(0.35)	(0.47)	(0.47)
%HIGHER EDUCATION	−11.6298	−13.7192	−2.3639	−0.0183	−0.0180
	(0.90)	(1.04)	(0.18)	(0.06)	(0.05)
%URBAN	0.0132	0.0123	0.0057	−5.3058	−5.6903
	(1.50)	(1.37)	(0.64)	(0.83)	(0.83)
OPTOMETRY SCHOOL	1.9662	2.1871	1.4446	5.4953	5.8079
	(3.76)	(3.62)	(2.72)	(1.38)	(1.31)
OPTICIAN SCHOOL	−0.2940	−0.2125	−0.1993	2.0477	2.2399
	(0.77)	(0.54)	(0.53)	(0.69)	(0.70)
R-EMPLOYMENT	−0.9636	−1.1140	−0.6781	4.3575	4.1352
	(2.58)	(2.61)	(1.80)	(1.49)	(1.27)
R-BRANCH OFFICE	−0.3415	−0.5629	−0.2971	−0.2315	−0.6698
	(0.89)	(1.15)	(0.78)	(0.08)	(0.17)
R-LOCATION	0.4776	0.3220	0.4837	−1.5555	−1.7531
	(1.24)	(0.73)	(1.27)	(0.50)	(0.52)
R-TRADE NAMES	0.1213	0.0195	0.0604	−2.3716	−2.6220
	(0.27)	(0.04)	(0.14)	(0.67)	(0.68)
R-PRICE ADVERTISE	−0.8894	−1.4290	−0.8590	−3.1484	−4.1147
	(2.42)	(1.73)	(2.36)	(1.05)	(0.64)
R-OPTICIAN ADVERTISE	0.1229	0.1012	0.3700	1.0324	0.9859
	(0.34)	(0.28)	(1.03)	(0.38)	(0.36)
*REG*PRICE ADVERTISE*		0.2348			0.4283
		(0.73)			(0.17)
$STORE_{t-1}$			1.0365		
			(122.20)		
CONSTANT	1.9675	2.4604	0.7700	6.7399	7.4408
	(1.62)	(1.77	(0.63)	(1.01)	(0.94)
	$\bar{R}^2=0.32$	$\bar{R}^2=0.32$	$\bar{R}^2=0.98$	$\bar{R}^2=0.58$	$\bar{R}^2=0.57$
	$N=765$	$N=765$	$N=765$	$N=51$	$N=51$

[a]Covariance model – year and regional dummies included.

Eq. (2) is modified (regional and year dummy variables are deleted) in order to use the cross-section data on the change in the number of optometrists as the dependent variable. The results of ordinary least squares (OLS) regressions are reported in columns D and E of table 2. The results suggest that each of the commercial practice restrictions has a statistically insignificant effect on entry by optometrists. Further, the hypothesis that the total effect of the restrictions is equal to zero cannot be rejected at the five percent level of significance ($F=0.81$ and 0.68, respectively). This result, in combination with the result that the total regulatory entry deterring effect is negative and significant for chain optical firms, provides support for the strategic regulatory entry deterrence hypothesis.

The results in table 2 also show that chain optical firms and optometrists enter states with higher population growth rates, and thus higher returns to entry, at a faster rate. This is consistent with Mullner and Hadley's (1984) result that population growth has a positive effect on the growth of propriety hospital chains and Benham, Maurizi and Reder's (1968) finding that physicians are more responsive in their location choices to the size of the population than to its per capita income.

Table 3 reports the results of OLS regressions that test the effects of the commercial practice restrictions on the number of opticians, optometrists, ophthalmologists, and chain optical firms per capita. These results also suggest that the commercial practice restrictions are effective in deterring certain types of entry or expansion. The employment and optometrist advertising restrictions have negative and statistically significant effects on the chain optical firm to population ratio. The optician advertising restriction has a negative and statistically significant effect on the optician to population ratio. Each restriction, however, has a statistically insignificant effect on the ophthalmologist and optometrist to population ratios. Further, the sums of the restriction coefficients in regressions A and E are negative and significantly different from zero at the 1 percent level ($F=4.76$ and 3.77, respectively), while the summed coefficients of the restriction in the ophthalmologist and optometrist regressions are positive, but statistically insignificant at the 5 percent level ($F=0.83$, 0.90 and 1.79, respectively).

5. Conclusion

Previous empirical research focusing on the price and quality effects of commercial practice restrictions in the market for ophthalmic services has demonstrated that optometrists' prices are significantly higher, while quality is not significantly different in states that restrict optometrists' business practices. Prices could be higher due to an entry deterring effect of the restrictions or due to regulatory induced inefficiencies in production or distribution. This paper focuses on the commercial restrictions' effects on

Table 3

OLS regressions on optometrist, ophthalmologist, optician and commercial optical store to population ratios (t-statistics are in parentheses).

	(A) 1985 *CHAIN/POP*	(B) 1970 *OPTOM/POP*	(C) 1982 *OPTOM/POP*	(D) 1983 *OPHTH/POP*	(E) 1969 *OPTIC/POP*
INCOME	0.0000	0.0015	0.0001	0.0000	0.0004
	(0.35)	(2.34)	(0.27)	(0.10)	(0.84)
%HIGHER EDUCATION	−6.9064	70.2927	91.5154	95.4293	99.0989
	(1.70)	(2.73)	(3.17)	(6.48)	(4.62)
%URBAN	0.0125	−0.0707	0.0920	0.0192	0.0489
	(4.33)	(3.69)	(4.87)	(2.03)	(3.06)
OPTOMETRY SCHOOL	−1.1209	2.8682	3.4126	−0.4784	−1.2423
	(0.94)	(3.16)	(3.60)	(1.03)	(1.64)
OPTICIAN SCHOOL	−0.0921	−0.0847	0.5578	−0.0186	0.6192
	(0.88)	(0.12)	(0.72)	(0.05)	(1.01)
R-EMPLOYMENT	−0.2725	0.8364	1.4467	0.0162	−0.4239
	(2.65)	(1.14)	(1.90)	(0.04)	(0.69)
R-BRANCH OFFICE	−0.0515	−0.9122	−1.2440	0.6126	−0.9003
	(0.54)	(1.32)	(1.75)	(1.76)	(1.56)
R-LOCATION	0.0112	0.7804	1.2104	0.0308	1.1057
	(0.10)	(1.04)	(1.50)	(0.08)	(1.76)
R-TRADE NAME	−0.0614	−0.8259	−1.3520	−0.6586	−0.1035
	(0.51)	(0.99)	(1.52)	(1.51)	(0.15)
R-PRICE ADVERTISE	−0.2839	0.3931	0.4434	0.1447	−0.0729
	(2.70)	(0.54)	(0.58)	(0.38)	(0.12)
R-OPTICIAN ADVERTISE	−0.2049	0.7250	1.0018	0.0013	−1.3617
	(2.17)	(1.08)	(1.42)	(0.00)	(2.43)
CONSTANT	0.9852	3.0716	8.8117	−1.2818	−2.5546
	(3.01)	(1.33)	(3.77)	(1.12)	(1.33)
	$\bar{R}^2=0.47$	$\bar{R}^2=0.28$	$\bar{R}^2=0.33$	$\bar{R}^2=0.65$	$\bar{R}^2=0.63$
	$N=51$	$N=51$	$N=51$	$N=51$	$N=51$

potential entrants, and thus provides support for the theory of strategic regulatory entry deterrence – the theory that subgroups of firms within an industry will use the regulatory process to increase rivals' costs and thereby deter rivals' entry. The results suggest that between 1970 and 1985 the restrictions decreased the annual rate of entry by one subgroup of firms within the ophthalmic industry. The three largest chain optical firms opened 1.5 to 1.7 fewer stores per year in fully regulated versus nonregulated states.

These results suggest that cost-raising strategies can be used to disadvantage rivals or drive them out of the market without the need to lower price. Government-assisted predation or predation by regulation.[19] is a possibility.

[19]Miller and Pautler (1985) coined these terms

References

Bain, Joe S., 1968, Industrial organization, rev. ed. (Wiley, New York).
Baumol, William J., 1982, Contestable markets: An uprising in the theory of industry structure, The American Economic Review 72, March, 1–15.
Baumol, W., J. Panzar and R. Willig, 1982, Contestable markets and the theory of industrial structure (Harcourt Brace Jovanovich, New York).
Benham, L., 1972, The effect of advertising on the price of eyeglasses, Journal of Law and Economics 15, Oct., 337–352.
Benham, L., A. Maurizi and M.W. Reder, 1968, Migration, location and remuneration of medical personnel: Physicians and dentists, Review of Economics and Statistics 50, Aug., 332–347.
Benham, L. and A. Benham, 1975, Regulating through the professions: A perspective on information control, Journal of Law and Economics 18, Oct., 421–447.
Demsetz, Harold, 1982, Barriers to entry, The American Economic Review 72, March, 47–57.
Duetsch, L.L., 1975, Structure, performance, and the net rate of entry into manufacturing industries, Southern Economic Journal 41, July 1974–April 1975, 450–456.
Federal Trade Commission, 1977, Staff report on advertising of ophthalmic goods and services and proposed trade regulation rule (16 CFR Part 456) (Government Printing Office, Washington, DC) May.
Federal Trade Commission, 1980, State restrictions on vision care providers: The effects on consumers ('eyeglasses II') (Government Printing Office, Washington DC) July.
Federal Trade Commission, 1980, Effects of restrictions on advertising and commercial practice in the professions: The case of optometry (Government Printing Office, Washington DC) Sept.
Feldman, R. and J. Begun, 1978, The effects of advertising: Lessons from optometry, Journal of Human Resources 13, suppl., 247–262.
Gamble, L., A.J. Mash, T. Burdan, R. Rutz and B.E. Spivey, 1983, Ophthalmology manpower studies for the United States, part 5, Ophthalmology manpower distribution 1983, Ophthalmology 90, no. 8, Aug., 233–250.
Gorecki, P.K., The determinants of entry by new and diversifying enterprises in the U.K. manufacturing sector 1958–1963: Some tentative results, Applied Economics 7, 139–147.
Haas-Wilson, E., 1986, The effect of commercial practice restrictions: The case of optometry, The Journal of Law and Economics 29, April, 165–186.
Hamilton, R.T., 1985, Interindustry variation in gross entry rates of 'independent' and 'dependent' businesses, Applied Economics 17, 271–280.
Hause, J.C. and G. Du Rietz, 1984, Entry, industry growth, and the microdynamics of industry supply, Journal of Political Economy 92, no. 4, Aug., 733–757.
Kwoka, J., 1984, Advertising and the price and quality of optometric services, American Economic Review 74, March, 211–216.

Maddala, G.S., 1977, Econometrics (McGraw-Hill, New York).
Mansfield, E., 1962, Entry, Gibrat's law, innovation, and the growth of firms, The American Economic Review 52, Dec., 1023–1051.
McCormick, R.E., 1984, The strategic use of regulation: A review of the literature, in: The political economy of regulation: Private interests in the regulatory process (Federal Trade Commission) March.
Miller, J.C. and P. Pautler, 1985, Predation: The changing view in economics and the law, The Journal of Law and Economics 28, May, 495–502.
Morrison, Steven A. and Clifford Winston, 1987, Empirical implications and tests of the contestability hypothesis, The Journal of Law and Economics 30, April, 53–66.
Mullner, R. and J. Hadley, 1984, Interstate variations in the growth of chain-owned proprietary hospitals 1973–1982, Inquiry 21, Summer, 144–151.
Organisation for Economic Cooperation and Development, 1985, Competition policy and the professions (Paris, France).
Orr, D., 1974, The determinants of entry: A study of the Canadian manufacturing industries, Review of Economics and Statistics 56, 58–66.
Oster, Sharon, 1982, The strategic use of regulatory investment by industry subgroups, Economic Inquiry 20, Oct., 604–618.
Peltzman, S., 1965, Entry in commercial banking, Journal of Law and Economics 8, Oct., 11–50.
Salop, Steven C. and David T. Scheffman, 1983, Raising rivals' costs, American Economic Review 73, May, 267–271.
Salop, Steven C. and David T. Scheffman, 1987, Cost-raising strategies, The Journal of Industrial Economics 36, Sept., 19–34.
Shepard, William G., 1984, Contestability vs. competition, The American Economic Review 74, no. 4, Sept., 572–587.
Sherman, R. and T.D. Willett, 1967, Potential entrants discourage entry, Journal of Political Economy 75, no. 3, June, 400–403.
Stigler, George J., 1968, The organization of industry (Irwin, Homewood, AL).
U.S. Department of Commerce, Bureau of the Census, U.S. Government Printing Office, Statistical abstract of the United States: Various years (Washington, DC).
U.S. Department of Health, Education and Welfare, National Center for Health Statistics, 1972, Opticians employed in the health services, U.S. 1968, ser. 14, no. 3, DHEW publication no. (HSM) 72-1052 (Government Printing Office, Washington, DC).
U.S. Department of Health and Human Services, 1984, Eye care visits and use of eyeglasses or contact lenses 1970 and 1980, DHHS publication no. (PHS) 84-1573 (Government Printing Office, Washington, DC) Feb.
Wallace, T.D. and Hussain, A., 1969, The use of error components models in combining cross section with time series data, Econometric 37, 55–68.
Yett, D.E. and F.A. Sloan, 1974, Migration patterns of recent medical school graduates, Inquiry 11, no. 2, June, 125–142.