ORIGINAL

UNITED STATES OF AMERICA
BEFORE THE FEDERAL TRADE COMMISSION
OFFICE OF ADMINISTRATIVE LAW JUDGES

In the Matter of	)	**PUBLIC**
THE NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS,	)	**DOCKET NO. 9343**
Respondent.	)	

COMPLAINT COUNSEL'S POST TRIAL BRIEF AND [PROPOSED] ORDER

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INTRODUCTION

Respondent the North Carolina State Board of Dental Examiners ("Board") is dominated by dentists, and is engaged in a campaign to exclude from the marketplace non-dentist providers of teeth whitening services. The Federal Trade Commission has previously determined that this conduct is not protected under the state action doctrine because "the Board is controlled by participants in the dental market," and the requirements of *Midcal*[1] are not satisfied. Opinion of the Commission, *In re North Carolina Board of Dental Examiners*, No. 9343, at 14, 17 (Feb. 3, 2011) ("State Action Opinion"). With the state action defense no longer at issue, the remainder of the case is straightforward and is controlled by prior precedent.

Non-state, private actors are generally not permitted to act in concert to eliminate their rivals. The exclusion of a new low cost competitor by incumbents is presumptively anticompetitive, and permitted only where there is a sufficient and offsetting efficiency

[1] *California Retail Liquor Dealers Ass'n* v. *Midcal Aluminum, Inc.*, 445 U.S. 97 (1980).

justification. This is Antitrust 101 and Economics 101. An empirical literature demonstrates that this straightforward and uncontroversial exclusionary model applies in full to exclusion by professional licensing boards.

To rebut this presumption of competitive injury, the Board asserts that non-dentist service is too risky to be permitted. As a matter of law, this purported justification is not a cognizable antitrust defense. Decisions regarding whether a service shall be offered to consumers are left to the market or to the State. Consumers value and desire non-dentist teeth whitening. And, again, the Commission has determined that the Board is not the State.

The case-specific evidence presented at trial confirms the wisdom and appropriateness of this analysis. In this case, competitors have taken it upon themselves to police the market without state supervision. Benign teeth whitening services have been banned. Rivals have been excluded. Most importantly, consumers in North Carolina have been harmed.

Even if the Board's "competition does not work here" defense were cognizable, the health and safety justification advanced by the Board still fails because it is not valid. The Board concocted an elaborate tale of potential health and safety risks, a tale unsupported by credible evidence. Furthermore, even if the Board's assertions had a sliver of merit, there are numerous alternatives less restrictive than a complete ban on non-dentist services. Under these circumstances, the decision to ban (or exclude) these new low cost rivals unnecessarily diminishes consumer welfare.

The record demonstrates that the Board has violated Section 5 of the FTC Act and that relief is necessary in order to prevent further consumer harm.

I. STATEMENT OF FACTS

A. The North Carolina State Board Of Dental Examiners Is Controlled By Dentists

The Board was created by the Dental Practice Act to regulate dentists and hygienists. The Board consists of six dentists, one hygienist, and one consumer representative. The dentist Board members, who must be licensed dentists in North Carolina, are elected by other licensed dentists. "[T]he Board is controlled by participants in the market." *State Action Opinion* at 13. By contrast, regulated persons directly elect far fewer, and sometimes no, members of the vast majority of other North Carolina boards. (CX0862 at 001-037). And unlike professional licensing boards in some other states (CX0488 at 020-021; White, Tr. 2255), the Board is not part of another North Carolina department.

The Board considers North Carolina dentists to be constituents. (CX0581 (Bakewell, Dep. at 20-21; White, Tr. 2276). Board members, "just like any other politician," campaign for office and try to be responsive to constituent questions and complaints. (Hardesty, Tr. 2796-2798; CX0581 (Bakewell, Dep. at 20-21; White, Tr. 2276; CX0102 at 001-002; CX0282 at 001; CX0365 at 001-002; CX0524 at 001-002; CX0620 at 001).

The members of the Board can run for reelection, and some dentists have served two or more terms. (CX0554 (Allen, Dep. at 7); CX0555 (Brown, Dep. at 9)). A dentist may send out statements explaining why he wants to be on the Board. (Wester, Tr. 1356). For example, one member was favored because of his position against independent practice for hygienists. (CX0554 (Allen, Dep. at 9-10, 58-59)). (CCPFF ¶¶ 50-59).

In addition to individual candidates seeking dentist support, the Board as an entity needs

support from dentists for certain of its agenda items. For example, to gain increases in their operating budget, the Board typically seeks assistance from the North Carolina Dental Society ("NCDS"), the professional association representing dentists and an affiliate of the American Dental Association. The NCDS will then join with the Board in asking the legislature to increase licensing fees, which generate the Board's budget. (Wester, Tr. 1386; CX0577 (Oyster, Dep. at 26-27)). The NCDS, in turn, seeks out assistance from the Board on matters of financial interest to its members. For example, at one meeting with the Board, the NCDS complained about the proliferation of non-dentist whitening operations and urged the Board to take action. (CX0565 (Hardesty, Dep. at 259-261; CX0109 at 003). The Board assured the NCDS that it was doing so. (CX0565 (Hardesty, Dep. at 260); Hardesty, Tr. 2866-2867).[2] (CCPFF ¶¶ 73-76, 131, 136, 222, 223).

B. The Board's Authority Under State Law Is Limited To Petitioning The Courts To Enjoin Or Sanction The Unauthorized Practice Of Dentistry In North Carolina

The Dental Practice Act provides that certain activities constitute the practice of dentistry. The Act authorizes the Board to address the alleged unlicensed practice of dentistry in either of two ways: the Board may petition a state court for an injunction, or it may request that the district attorney initiate a criminal prosecution. (CX0019 at 021-023). Pursuant to this

[2] For these reasons, the Commission observed in its State Action Opinion, "The Board's judgment under such economic and political pressures can hardly be characterized as sufficiently independent that the Board may bypass active supervision by the state, yet still enjoy the antitrust exemption accorded only to a state's sovereign acts." *State Action Opinion* at 14. As a result, the Commission found that the Board was subject to the active supervision requirement. The record has only grown stronger on this issue.

authority, the Board has on occasion sought relief in both civil and criminal cases.[3] These actions are not challenged here. On the other hand, the detailed provisions of the Dental Act do not provide the Board with the authority, on its own, to order an alleged violator to cease and desist from the unlicensed practice of dentistry, let alone from conduct that may not fall within the practice of dentistry, as defined by statute. Yet the Board has repeatedly done so. This case challenges those actions, as well as other naked efforts to exclude competitors of dentists from providing teeth whitening services.

The Commission has already determined that the Board has not established the elements for a state action defense; in particular, the Board has not shown that it is actively supervised. *State Action Opinion* at 17. North Carolina law establishes no mechanism for any person or entity to review a Board decision to issue a cease and desist order to a non-dentist before the order is issued (or even thereafter). Annual reports by the Board and financial interest statements by Board members do not enable any governmental entity, including the Governor, the Attorney General, and the Ethics Commission, to examine Board decisions before or near the time that the Board acts. Because no disinterested governmental entity engages in any review, the Commission conclusively found the state action defense unavailable to the Board. *State Action Opinion* at 14-17.

C. Teeth Whitening Can Be Provided by Dentists, Non-Dentists, Or Self-Applied With Over-The-Counter Products

1. Teeth Whitening Prior To 1989

During the 1930s, when the Dental Practice Act was amended and stain removal was

[3] All were resolved without judgment on the merits. (Respondent's Response to Complaint Counsel's Request for Admissions ("RFA") ¶ 22).

declared the practice of dentistry, teeth whitening was mainly relegated to dead, or non-vital, teeth. The chemical used for this bleaching, Superoxyl, a highly concentrated hydrogen peroxide, was applied with a heated spatula, and the combination of Superoxyl and heat often would kill any living tooth to which it was applied. (Giniger, Tr. 111-115, 373; CX0653 at 023).

With respect to vital, or living teeth, "'stain removal' was likely to mean the physical removal of stains from teeth. . . . [Such as] either scraping off of stains that, for example, a dental hygienist or a dentist would do with a dental scaler or abrasion of the stain using a rotary instrument." (Giniger, Tr. 111). The use of these scalers and abrasives were the principal modes of stain removal in the 1930s. Modern day teeth whitening processes were not available during that period. (Giniger, Tr. 111).

In fact, modern teeth whitening with peroxide solutions does not actually result in the removal of stains; rather, the process causes a chemical reaction that lightens the tooth. Stains consist of double bonded carbon atoms. When the hydrogen peroxide is activated on the teeth, free radicals (oxygen) cleave some of the double bonds. This lightens the stain. The stain is not actually removed. As a result, in terms of both a scientific and historical context, the reference to "removal of stain" as the practice of dentistry in the Dental Practice Act, enacted in the 1930s, most likely referred to physical removal of stains with a scaler or abrasive rather than chemical bleaching. (Giniger, Tr. 111, 116-118, 142-143, 151-154, 244-245; CX0653 at 006, 018-019; CCPFF ¶¶ 161-165, 167-173, 722, 746-747, 750, 753-754).

2. Four Broad Categories Of Teeth Whitening

There are four principal categories of teeth whitening services currently available in North Carolina and around the country: (1) dentist take-home teeth whitening products; (2)

dentist in-office teeth whitening services; (3) over-the-counter ("OTC") teeth whitening products; and (4) non-dentist teeth whitening services in venues such as salons, warehouse clubs, cruises, and mall kiosks. (CX0392 at 002). These categories have evolved over time in response to consumer demand, and each of these has its own advantages and disadvantages. (Giniger, Tr. 118-121; Kwoka, Tr. 981-984; Valentine, Tr. 529-530, 551-553; Nelson, Tr. 732-733, 739-743; Osborn, Tr. 662-663).

In 1989, the industry expert retained by the Board for this litigation, Dr. Van Haywood, together with Dr. Harald Heymann, published their seminal article, "Night-Guard Vital Bleaching." (CX0553 at 001-004). As a result of their publication, Drs. Haywood and Heymann achieved substantial notoriety in the dental world. (Haywood, Tr. 2583-2586; CX0565 (Hardesty, Dep. at 193-194)). The authors demonstrated that teeth whitening for vital teeth could safely be achieved through overnight use, for four to six weeks, of a custom mouth guard filled with carbamide peroxide, a less concentrated formulation of hydrogen peroxide (the ratio is approximately 3:1, 30% carbamide peroxide equals 10% hydrogen peroxide). In Night-Guard Vital Bleaching, a dentist makes a custom tray and provides the patient with applicators full of hydrogen or carbamide peroxide. At home, the patient fills the tray with peroxide from the applicators. The patient may then either wear the tray overnight or during the day, depending on customer preference. (CX0553 at 001-004; Wester, Tr. 1289). The take-home kits can be used either as a follow-up to the in-office treatment, or as the sole whitening service. Used alone, a take-home kit can take many weeks to whiten teeth. Dentists charge $300-$500, and sometimes more, for the tray, the peroxide, and appointments. (Giniger, Tr. 200-201; CX0652 at 019-020).

The safety of low concentrations of hydrogen peroxide was widely recognized well

before 1989. Since its discovery in 1818, hydrogen peroxide has long been used and regarded as safe in industrial, agricultural, and consumer product applications. Its safety has been reviewed by domestic scientific bodies and regulatory agencies, including the FDA. (Giniger, Tr. 210-212; CX0653 at 023-024). Its safety is amply demonstrated by the fact that hospitals used "Proxigel," a 10% carbamide peroxide concentration, with newborn infants to help clear their throats. (Wester, Tr. 1310, 1353; Haywood, Tr. 2578; CX0550 at 002). Hydrogen peroxide is also used for cuts and as mouth-rinses to reduce plaque in individuals with gingivitis and for treatment of periodontal diseases. (CX0550 at 001; Jt. Stip. Fact ¶ 23; CX0653 at 024-025). The FDA has classified hydrogen peroxide as a cosmetic rather than a drug. (CX0487 at 002; CX0496 at 001-002 (P&G opposition to ADA petition to reclassify hydrogen peroxide)). Cosmetics are marketed over-the-counter and directly to consumers.[4] The only significant and common side effect as part of its use in tooth whitening has been transient teeth sensitivity, which typically does not last longer than a day or two. (Giniger, Tr. 353-356).

Around 1991, in-office bleaching of living, or vital, teeth began to emerge in response to demand for faster results. (CX0550 at 002-003; CX0392 at 002; CX0653 at 024, Giniger, Tr. 149-150). The in-office process, also known as dental chairside bleaching, uses highly concentrated hydrogen peroxide (25% to 35%), applied multiple times during a single office visit. At these concentrations, application of a gingival barrier is recommended to prevent gingival irritation before applying the peroxide solution. (Giniger, Tr. 169, 172; CX0653 at 020-

[4] In 1991, the FDA considered reclassifying peroxide as a drug rather than a cosmetic. In 1998, members of the teeth whitening industry were informed that "the Agency does not at this time or in the foreseeable future intend to expect to take any enforcement action against the marketing of the products, which are the subject of the Citizen Petition, based upon their regulatory status (as cosmetics)." (CX0400 at 008).

021). Then the peroxide solution is painted on the teeth. Dentists commonly direct a light source at the teeth, which according to some studies helps to "activate" the whitener. (CX0653 at 021). The procedure has immediate whitening results. Some reports suggest that in-office whitening will last for years. (CX0588 at 005). Popular brands include BriteSmile, Zoom, and Opalescense. A dentist's in-office whitening procedure reportedly costs $300 to $500, and sometimes more. (CX0560 (Feingold Dep. at 183) ($500); CX0096 at 004 ($400-$900); Hardesty, Tr. 2805-2806 ($675-$750); CX0588 at 005 ("500 to 1500+")).

In 2000, the efficacy of whitening "strips" was shown, and Proctor & Gamble introduced Crest White Strips: clear, thin, flexible pieces of plastic (polyethylene) that are coated on one side with a thin film of hydrogen peroxide bleaching agent. (CX0653 at 041-042; Giniger, Tr. 205-206; CX0053 at 001). The concentration of OTC products typically varies from 6% to 22% carbamide peroxide. (Haywood, Tr. 2402). The lower concentration means that they take longer to work. Nonetheless, because of their relatively low price ($45-$75), easy availability, amenability to home use, and lessened risk and amount of sensitivity, Crest White Strips and other OTC products became immensely popular with the public. (CX0653 at 041-042). Since OTC teeth whitening products have been introduced, there have been hundreds of millions of uses. (Ginger, Tr. 219, 240-241). Numerous studies have shown the OTC products to be safe and effective. (Ginger, Tr. 240-241; CCPFF ¶¶ 492, 884-885, 896-898, 997, 963-979).

Around 2003-2004, an innovative teeth whitening service arrived. This service, non-dentist teeth whitening, provides same day results similar to an in-office procedure in terms of speed but at prices closer to those of OTC products. (Baumer, Tr. 157; Kwoka, Tr. 983-984; Valentine, Tr. 517; Osborn, Tr. 647; Nelson, Tr. 724-725). Non-dentist teeth whitening

operators primarily offer teeth whitening services to the public in beauty salons, spas, warehouse clubs, fitness centers and malls. (Nelson, Tr. 726).

This market niche was exploited around the country. Teeth whitening was desired but often either too expensive or too time consuming. Entrepreneurs saw this business opportunity and seized it. (Valentine, Tr. 517) (high prices offered by dentists for teeth-whitening was a primary motivator for White Smile USA to enter the market); Nelson, Tr. 724-725, 740-743; Kwoka, Tr. 981-984; Giniger, Tr. 120-121, 353). Salons added teeth whitening because of its natural fit and because of its large profit opportunity. Joyce Osborn testified:

> [I]n the salon business we were offering a head-to-toe look, and in all essence we weren't giving that because when I would do a makeover I noticed the teeth were so yellow, it kind of bothered me, and I started feeling that we needed to fill a void in this industry, so that's why I invented the BriteWhite Teeth Whitening System.

(Osborn, Tr. 648). Brian Wyant, who became a teeth whitener, realized there was "a great business opportunity" when he was told that customers could purchase teeth whitening in a mall for $129 or $199 compared to the almost $900 Wyant paid to have his teeth whitened in his dentist's office in 2007. (Wyant, Tr. 860-861). Margie Hughes testified that she began teeth whitening because she could not afford the over $500 her own dentist charges to whiten teeth. (Hughes, Tr. 934-935). The non-dentist services charge in the $79-$150 range. (CX0653 at 043; Kwoka, Tr. 984).

Non-dentist operations typically use concentrations of up to 12-15% hydrogen peroxide, which lessens the risk of burning. With the lower concentration, the peroxide can also have a neutral pH, which lessens the sensitivity issues found with dentists' chairside bleaching. (Giniger, Tr. 173). And the non-dentist operators often use an LED light activator, believed by

many to speed up the whitening process without the sensitivity issues caused by the more intense, hotter UV lights used in some popular dentist in-office systems. (Valentine, Tr. 523-524; Nelson, Tr. 740, 744, 766; Osborn, Tr. 650-652; Giniger Tr. 182-183, 192; CX0653 at 020-021). This combination of factors resulted in significant demand for this new service and business grew rapidly. (Valentine, Tr. 546, 582; Nelson, Tr. 724-725, 733-734). For example, White Smile grew from nothing to 130 employees in less than 3 years. (Valentine, Tr. 546).

Both Dr. Giniger and Mr. Nelson demonstrated to the Court the typical non-dentist teeth whitening process. The Board did not challenge or otherwise contest the accuracy of these demonstrations. A non-dentist operator will explain the procedure to the customer, provide the customer with literature, sometimes including a consent form, and answer questions before the procedure begins. The operator will don sanitary gloves and hand a sealed package containing a tray filled with carbamide peroxide to the customer, who places the tray into his or her mouth. A light "activator" is then put in place by either the customer or the operator. The process lasts approximately 20-45 minutes, after which the customer either returns the tray to the operator for disposal or disposes of it herself. The operator does not touch the customer's mouth. The protocol for these procedures is laid out in writing by the manufacturers, and most follow the protocol adopted by the Council for Cosmetic Teeth Whitening ("CCTW"). (Ginger, Tr. 188-189, 349-352, Nelson, Tr. 834; Osborn, Tr. 675-677; Valentine, Tr. 533-534). The process is designed so that the customer self-applies the solution. (CCPFF ¶¶ 457-459).

D. For Modern Teeth Whitening, Dentist And Non-Dentist Services Have A "High Cross Elasticity"

Dentist and non-dentist assisted teeth whitening have a "high cross elasticity" - they are

relatively close substitutes. (Kwoka, Tr. 999-1000; Baumer, Tr. 1842; Giniger, Tr. 118-120, 347-348; Nelson, Tr. 740-741; CX0565 (Hardesty, Dep. at 87); CX0556 (Burnham, Dep. at 152)). This is evidenced by the similar characteristics of the services, as well as public and industry recognition.

Anyone seeking same day whitening must go to the dentist or to the mall/salon for in-chair whitening. (Giniger, Tr. 118-121; CX0560 (Feingold, Dep. at 184); Nelson, Tr. 740-741). Both in-chair dentist and non-dentist teeth whitening use higher peroxide concentration than is used in typical OTC products available in drug stores and supermarkets and thus work faster. In comparison to OTC products, non-dentist and dentist teeth whitening are also closer in terms of the services provided, including instruction, provision of a tray, loading of the peroxide, convenience, and use of a light activator. "[I]t seems like you have a similar lineup [of attributes] with the kiosk versus the dentist." (CX0826 (Baumer, Dep. at 126-127)).

Dentists and non-dentists believe that they compete with one another. (Nelson, Tr. 725, 740; Osborn, Tr. 697; CX0422 at 001). Non-dentist teeth whitening operators compare their services to dentists, and advertise and charge lower prices for their services than dentists charge for their teeth whitening services. (CX0043 at 005 (Bleach Bright salon: $99); CX0198 at 002 (Movie Star Smile salon: $99)). Mr. Valentine stated that White Smile's prices were 60% to 70% less than dentist product BriteSmile and 30% to 40% less than dentist product Zoom, and that White Smile stressed this price advantage to customers. (Valentine, Tr. 550, 552; CX0108 at 009). In fact, customers indicated that the high price of dentist whitening influences their decision to go with non-dentist teeth whitening. (Valentine, Tr. 552-553). Non-dentist teeth whitening within a two mile radius of a dentist, and perhaps beyond, provides competition.

(CX0565 (Hardesty, Dep. at 87); CX0626 at 002 (Mar. 7, 2008) (former hygienist stating "it does affect the local dentist"); CX0163 at 001 (Mar. 15, 2008) (News & Observer article: consumers liked teeth bleaching at mall kiosks because "they are convenient and cheap – usually about $100 instead of the $500 or $600 charged at a dentist's office")).

Dentists commonly tout the advantages of using a dentist rather than a non-dental teeth operator, focusing on the dental training and need for a screening. Complaining dentists often include salon advertisements, and highlight the prices charged by the non-dentists, which is consistent with a concern over price competition. (CX0036 at 002 (Sept. 2004 complaint noting the second salon to offer whitening in North Carolina was advertising non-dentist teeth whitening for "less than dentists charge"); CX0365 at 002 (Nov. 2007 complaint from dentist about a non-dentist teeth whitening salon stating: "They charge $100!"); CX0626 at 001-002 (complaint from dental assistant mentioning the low price and stating "I am not affected by this in any financial way but . . . it does affect the local dentist"); CX0278 at 001 (complaint noting that the non-dentist charged $99); CX0572 (Wester, Dep. at 146-151)).

The competition between the products is also acknowledged in American Dental Association documents. The ADA has publicly identified the teeth whitening market as including both dentist and non-dentists. Internally, the ADA implicitly acknowledges public recognition of the competition. For example, one ADA official suggested revising a backgrounder for "Good Morning America" because it "looks marketplace (as in threats, competition) oriented." (CX0488 at 009). The ADA is aware that efforts by dentists to eliminate entirely non-dentist teeth whitening will lead the public to conclude that dentists are protecting their "turf;" that is, that dentists are more concerned with monopolizing "lucrative

cosmetic services than with access to care issues." (CX0487 at 008; CX0488 at 043).

In addition, the fact that the ADA has proposed ways to compete in the marketplace shows the existence of competition. In this respect, the ADA differentiates dentist from non-dentist teeth whiteners in terms of training, privacy, and professional ethics. (See CX0595 at 002 ("[T]here is the goldfish factor to consider. When you whiten at home or in the dental office, your privacy is respected. At a mall kiosk, people can stand around and watch you during the whole procedure."); CX0185 at 001 ("To a dentist you are a patient - to whitening kiosk staff, you are a customer.")).[5]

Moreover, Discus Dental, the largest manufacturer of whitening products for dentists, maker of Zoom and BriteSmile, has included salon/mall operations in its consumer surveys, showing industry recognition of non-dentist competition. (CX0489 at 013). The survey found that on several different attributes, including convenience, value, and pain, consumers rate these non-dentist teeth whitening operations in between OTC products and dentist provided products. (CX0489 at 031-032, 044-045, 050, 052). These products would be the closest teeth whitening substitutes for many consumers.

E. Dentists Have A Financial Interest In Preventing Non-Dentist Teeth Whitening

Teeth whitening or bleaching is the number one requested cosmetic dentistry procedure.

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[5] In the event that non-dentist teeth whiteners are allowed in a state, the ADA recommended in favor of notice and disclosure but *against* training. This is best understood as a way to gain or maintain a competitive strategy versus non-dentist teeth whitening. The ADA is concerned that although notice and disclosure may warn consumers, training may encourage consumers to try non-dentist teeth whitening because it "could provide such businesses with added credibility." (CX0488 at 045; Wester, Tr. 1388-1389.)

(CX0392 at 002; CX0397 at 001).[6] According to a 2010 Gallup poll, 80% of people believe that whiter teeth make a person look younger. (CX0583 at 098). A study by the American Academy of Cosmetic Dentistry ("AACD") found that 99.7% of adult American respondents believed that a smile is an important social asset, and 74% believed an unattractive smile could hurt a person's chances for career success. (CX0385 at 003). In 2007, the AACD reported that dental teeth whitening procedures increased more than 300% over the previous five years. (CX0397 at 001).

As a result of the large demand, over 80% of dentists provided in-office or take home whitening to their patients. (CX0513 at 007). Teeth whitening can be lucrative for dentists. The Board's constituents may earn tens of thousands of dollars per year by whitening teeth. For 2006, AACD members averaged teeth whitening revenues of $25,000 (total of $138.8 million). (CX0383 at 002). This figure is consistent with reports from North Carolina dentists; some dentists who complained to the Board about teeth whitening earned teeth whitening revenues of $30,000 per year or more in recent years. (CX0602 at 002; CX0600 at 003; CX0603 at 003). Several Board members have earned tens of thousands of dollars annually from teeth whitening. (CX0467 at 001; CX0606 at 005; CX0378 at 005).

The Gallup poll also found that dentists not providing teeth whitening might do so if there were product improvements or lower costs. (CX0513 at 029). To offer teeth whitening, all that is required is for a "general" dentist to start advertising cosmetic dentistry services. (Wester, Tr. 1341-1343; CX0571 (Owens, IHT at 14, 40); CX0556 (Burnham, Dep. at 10, 145); CX0578 (Parker, Dep. at 10-11); CX0567 (Holland, Dep. at 14, 38)). No certification is necessary. In other words, under the right economic conditions, dentists can easily add teeth

[6] Cosmetic dentistry consists of optional services.

whitening to their practice.

Because dentists are market participants, the Board and/or its members have a financial interest in preventing competition from non-dentist teeth whiteners. *State Action Opinion* at 14. (Kwoka, Tr. 1114; CX0826 (Baumer, Dep. at 105-106, 133-134)). As the Board's expert economist admitted, Board members "may well be influenced by the impact on the bottom line" in deciding whether to ban non-dentist teeth whitening. (CX0826 (Baumer, Dep. at 107)).

The Board's constituents also fear that permitting teeth whitening competition may open the floodgates to other negative consequences for dentists. As Dr. Haywood, the Board's industry expert, unabashedly testified,

> If we are unable to define what a dentist does based on their training and education, then we have opened the door for the lowest level of 'mid-level provider,' the mall bleacher. . . . I believe this bleaching question will be what the definition of the profession hinges on for the future. If you cannot defend the position that it is best to see a dentist, then there is no need for a dentist for any other treatments.

(Haywood, Tr. 2914-2915, 2627; CX0278 at 001 (after observing a $99 teeth whitening, a dentist complains that mall bleaching "cheapens and degrades the profession" and "teaches the public to not value or respect the dental profession."); CX0422 at 001 ("If we as dental professionals do not take a stand, then it will not be to [sic] long that the patient will be doing their own dental work outside of the dental office.")). A leading manufacturer of dentist teeth whitening products fomented action against its non-dentist competitors by fanning the flames of this fear: "These procedures . . . threaten to blur the important line between health-care procedures that must be conducted under the supervision of licensed dental professionals, and those that do not." (CX0501 at 001).

The Board's incentive to prevent competition creates conflicts with the public interest. (Kwoka, Tr. 1111-1112; Baumer, Tr. 1915). As the Commission observed, "Absent antitrust to police their actions, unsupervised self-interested boards would be subject to neither political nor market discipline to serve consumers' best interests." (*State Action Opinion* at 11).

F. The Board Has The Power To Exclude

By virtue of their statutory and regulatory authority, licensing boards "have the power to exclude competition that does have an impact financially"; the Board is in a position to impose entry barriers. (Baumer, Tr. 1840; CX0826 (Baumer, Dep. at 66-67, 138)). The Board has the power to enhance the incomes of dentists in North Carolina by preventing competition from non-dentist teeth whiteners. (Kwoka, 1115-1116; Baumer, Tr. 1840; CX0826 (Baumer, Dep. at 66-67)).

G. The Board Is Excluding Competition From Non-Dentists, And Is Acting Independent Of The Courts

At least by late 2003, the Board started receiving complaints from dentists about teeth whitening in salons and kiosks (CX0033 at 005 (Sept. 2003)). Complaints to the Board are received by the Board Secretary, one of the dentist members, who then assigns the matter to a dentist member (including himself) for action. The Board delegates authority to that dentist Board member, known as the Case Officer, to review the complaint, determine whether to investigate beyond the bare statements in the complaint, and decide whether to pursue litigation or issue a Cease and Desist Order. Although the Case Officer has the authority to act for the Board to prevent non-dentist teeth whitening, the Case Officer must gain the approval of the Board to close a case without taking action - making it harder to close a case than to issue a

Cease and Desist Order or initiate civil or criminal proceedings. (Wester, Tr. 1281-1284, 1286; Owens, Tr. 1440-1443).

The Board is complaint driven. (Owens, Tr. 1641; Kwoka, Tr. 1212-1213; CX0555 (Brown, Dep. at 33-35); CX0556 (Burnham, Dep. at 247-248)). Rather than searching for health and safety risks to consumers or the general public, the Board investigates the unauthorized practice of dentistry only upon complaint.

Complaints that do not involve non-dentist teeth whitening are typically from a consumer against a dentist, often alleging inadequate care and harm. However, there are two areas where complaints from dentists dominate and both share one characteristic - Board enforcement will reduce competition. One area is complaints from a dentist that another dentist is engaged in some type of improper advertising. (CX0566 (Hardesty, IHT at 76-77)). The other involves complaints against non-dentist teeth whitening. The latter were submitted almost entirely by dentists and almost never alleged any actual consumer harm. Of the 50 teeth whitening-related complaints, only four referenced consumer harm, only three were from consumers (Respondent's Response to RFA ¶ 18) and, although numerous dentist complaints were submitted beginning in 2003 (CX0033 at 001-005), the first allegation of consumer harm was not made until 2008. (CX0055 (April 11, 2008)).

The investigations are often initiated on the basis of a dentist's faxed cover sheet attached to a newspaper advertisement placed by a non-dentist teeth whitener. Because the advertising is local in nature, complaints often come from dentists in competition with the non-dentist teeth whitener. (CX0037 at 001 (nearby complaining dentist saw the Spa's ad); CX0251 at 001 (complaint by dentist in the same shopping center who received ad distributed to tenants)). In

contrast, most complaints from a consumer relate directly to consumer harm, not potential competitors. (CX0527 at 008; CCPFF ¶¶ 272-275).

Initially, as contemplated by the Dental Practice Act, the Board challenged non-dentist teeth whitening in the courts, both in civil and criminal proceedings. With respect to the latter, the Board must convince a local prosecutor to initiate a case to prosecute these acts as the unlicensed practice of dentistry. On four occasions the Board initiated litigation; on four occasions the Board accepted settlement or voluntary dismissal rather than risk losing on the merits. (CX0073 at 004-006; RX0008 at 015-017; CX0581 (Bakewell, Dep. at 243-251); CX0103 at 003-012; CX0040 at 008; CX0034 at 007; CX0040 at 004; CX0034 at 003; CX0573 (White, Dep. at 58-59); CCPFF ¶¶ 243-253).

At the same time that non-dentist whitening operations were proliferating, the Board was also investigating jewelry stores that were fabricating "grills" - cosmetic crowns (*e.g.,* gold, "bling," fangs) that are worn temporarily for decorative purposes. The Board challenged one jewelry store in court, alleging the unauthorized practice of dentistry because the store took impressions of teeth and the store manufactured and sold the product. Board members in that matter, *Brunson,* as here, proclaimed that the sale of these products by non-dentists would result in serious injury and death. (CX0141 at 001-002). Nonetheless, the North Carolina state court determined that the Dental Practice Act did not cover the practice of manufacturing and selling grills. (CX0159 at 001, 006; White Tr. 2331; CCPFF ¶¶ 226-231).

This was yet another instance where the Board failed to obtain the complete victory it was seeking. After the decision in *Brunson,* the Board believed that courts would be narrowly interpreting the Dental Act for noninvasive techniques such as teeth whitening. (CX0554 (Allen,

Dep. at 133)). One member of the Board related that the judge had ruled the fabrication of "grills" to be no different than a child wearing a set of wax teeth. (CX0576 (Litaker, Dep. at 40, 85-87)). It was becoming increasingly clear to the Board that outcomes from court actions were not likely to achieve the desired result. This view was later reinforced when the Attorney General's office communicated the position that non-dentist teeth whitening was not unlawful. (CX0167 at 002; CCPFF ¶ 242).

In 2005, a Board investigator suggested that the Board issue its own Cease and Desist Orders against other grill operations – in order to avoid the risk of losing in court for lack of evidence. (CX0080 at 002). In the e-mail string, the investigator states "I also must say that I really do like the cease and desist letter . . . I think in the past, we have had several of these type of cases (person is allegedly treating patients without a license) that ended up getting closed because we didn't have evidence . . . ." (CX0080 at 002). Board counsel approved this tactic. (CX0080 at 001; White, Tr. 2335).

Beginning in 2006, the Board adopted this same tactic with respect to complaints submitted by dentists about non-dentist teeth whitening. The Board issued Cease and Desist Orders to short-cut the need for evidence and independent review. As discussed above, this action is beyond the Board's statutory authority. Yet, the Board not only issued Cease and Desist Orders, but admittedly has been unconcerned with whether or not there is any evidence that the non-dentist provider is doing anything unlawful. (CX0562 (Friddle, IHT at 47) (in 2007 and 2008, cease and desist orders were sent "fairly quickly, like shortly after the case was set up."); CX0281 at 001). Instead, the Board on occasion issues these Cease and Desist Orders as a *substitute* for the process of gathering evidence and going to court. (CX0562 (Friddle, IHT at

43-44) ("[I]f it is unclear as to whether or not, or if it appears that there's a violation, then we would send a cease and desist , you know."); CX0297 at 001 (Dec. 1, 2008) (Dr. Owens authorized cease and desist 12 minutes after being assigned case); CX0311 at 001 (Dr. Owens authorized cease and desist same day as receiving assignment); CX0248 at 001 (Jan. 25, 2008) (sent out C&D; later determined there was no violation); CX0555 (Brown, Dep. at 231) (if not clear that case against a target can be won in court, the Board would "probably" issue a Cease and Desist Order)). This process led one Board member to question whether it was permissible to send out the letters without any substantiation that a law had been broken. After consulting with Board counsel and staff, and learning that other Board members proceed without evidence, he okayed the sending of a Cease and Desist Order prior to investigation. (CX0070 at 001-002).

Over the past seven years, the Board has sent numerous cease and desist orders to non-dentist teeth whitening operators. Most often, these documents commence with a bold, all capitals heading: "NOTICE AND ORDER TO CEASE AND DESIST" (CX0387 at 001) or "NOTICE TO CEASE AND DESIST" (CX0100 at 001) or "NOTICE OF APPARENT VIOLATION AND DEMAND TO CEASE AND DESIST." (CX0153 at 001 (Sept. 2009)). The body of the Orders varies to some degree. Some state "You are hereby directed to Cease and Desist" or "The Dental Board hereby demands that you CEASE AND DESIST." Others state "You are hereby Ordered to Cease and Desist" and "Notice to Cease and Desist." For example, in December 2007, where the sole offense was using an LED light, the Board sent a letter with the latter heading. (CX0100 at 001). The document continued: "The Board hereby directs your company to cease its activities unless they are performed or supervised by a properly licensed North Carolina dentist." Although Orders reference a possible Board

investigation, the body of the letters reiterate the message of the bold heading, usually with language such as: "You are hereby ordered to CEASE AND DESIST any and all activity constituting the practice of dentistry or dental hygiene as defined by North Carolina General Statutes §90-29 and §90-233 and the Dental Board Rules promulgated thereunder." (CX0096 at 001). To further instill an official air, the Board sends these letters certified, return receipt (CX0096 at 001; CX0386 at 001), and on occasion, has a sheriff attempt service of a cease and desist letter. (CX0095 at 001-002; CCPFF ¶ 292).

The Board has at trial characterized these letters variously as mere warnings, notices or requests, but contemporaneous documents confirm that the letters are intended, and understood by recipients, as Orders from a state agency to stop teeth whitening activities. Emails, letters, and reports drafted by Board members and Board staff confirm that the documents sent were cease and desist orders. (CX0254 at 001 (email from Carolin Bakewell (Nov. 27, 2007) (stating that the Board "has recently issued cease and desist orders to an out of state company that has been providing bleaching services in a number of malls in the state")); CX0347 at 001 (email from Line Dempsey (Jan. 18, 2007) (salon was sent "a Cease and Desist Order")); CX0258 at 001 (Investigative Memo from Line Dempsey (Jan. 17, 2008) (kiosk teeth whitening vendor: "Mr. Cogan explained that he had not officially received a Cease & Desist Order. I explained that Mr. Nelson [the owner] said that he had, and I was informing him verbally that he needed to cease and desist . . . . Before leaving, I explained, once again, that I was a representative of the NC State Board of Dental Examiners and that he was practicing dentistry without a license and that he should cease and desist.")); CX0404 at 001 (email from Bobby White (Feb. 20, 2008) (response to dentist complaint: "[w]e've sent out numerous cease and desist orders throughout

the state")); CX0523 at 001 (email informing potential non-dentist teeth whitener: "you may not operate a whitening kiosk except under the supervision of a licensed North Carolina dentist. . . . The prohibition remains the same even if the customer inserts the whitening tray themselves."); CX0303 at 005 (Open Investigative File memo listing a number of operations that had received "Cease and Desist Orders")). One document states the investigator "was able to serve the Cease and Desist Order" (CX0350 at 001 (November 26, 2007)) - a reference to service also reflects a belief that the letters were part of an official process. (CCPFF ¶ 303).

In fact, Board members, as well as Board counsel and staff, admitted that the letters were meant to be taken as Orders from the Board. (CX0572 (Wester, Dep. at 57 (noting that the cease and desist order was a message that "they should stop" or "cease and desist" from engaging in teeth whitening activities)); CX0554 (Allen, Dep. at 126 (agrees, "board saying that you not only are ordered but you have the responsibility to comply with this order"); CX0554 (Allen Dep. at 127-128 ("It's an order in the same sense that the board as the State's designee to regulate the practice of dentistry and protect the public is – is telling you not to do this anymore. . . . I mean, the letter implies that if you continue to do it you'll either be fined or in prison if you continue.")). Dr. Wester testified that he treats a cease and desist order sent by a case officer as essentially the same thing as an injunction or a court order (Wester, Tr. 1337-1338, 1352-1353) because the expected impact of a cease and desist letter is that the recipient will stop doing what the Board wants them to stop doing. (Wester, Tr. 1352). Trial witnesses from the industry testified as to their understanding that the letters constituted official Orders from the Board. (Nelson, Tr. 789; Osborn, Tr. 671-673; CCPFF ¶¶ 659, 662).

The language of and intent behind these letters to non-dentist teeth whitening operations

stand in stark contrast to earlier Board correspondence relating to the unauthorized practice of dentistry. For example, in October 2000, a letter to one company had no heading stating "Cease and Desist," nor did the body of the letter state "You are hereby ordered to cease and desist." Instead, the Board stated "This is to advise you that the North Carolina State Board of Dental Examiners is considering initiating a civil suit to enjoin you from the unlawful practice of dentistry." (CX0136 at 001; CX0139 at 001 (Dec. 2001); CX0138 at 001 (Feb. 2002); CCPFF ¶ 1386). The Board knew how to draft a proper cautionary letter. But by 2006 the Board had concluded that a cautionary letter was inadequate to its purpose. A purported Cease and Desist Order better fits its exclusionary goal.

In its decision on the Motion for Partial Summary Decision, the Commission found as an undisputed fact that these letters were meant as and taken as Orders from the Board. *State Action Opinion* at 5. The additional evidence cited here and in Complaint Counsel's Proposed Findings of Fact further support this finding. (CCPFF ¶¶ 293-314).

The Board has acted in other extra-judicial ways to stop non-dentist teeth whitening operations. For example, the Board sent Cease and Desist Orders to suppliers, cutting off actual and prospective non-dentist teeth whiteners from the means of doing business in North Carolina.

The Board also sent at least 11 letters to third party out-of-state mall owners and operators:

> North Carolina law specifically provides that the removal of stains from human teeth constitutes the practice of dentistry. See N.C. Gen. Stat. 90-29(b)(2), a copy of which is enclosed. The unauthorized practice of dentistry is a misdemeanor. See N.C. Gen. Stat. 90-40, a copy of which is also enclosed
>
> It is our information that the teeth whitening services offered at these kiosks are not supervised by a licensed North Carolina

dentists. Consequently this activity is illegal.

(CX0203 at 001; CX0204 at 001; CX0205 at 001; CX0259 at 001; CX0260 at 001; CX0261 at 001; CX0262 at 001; CX0263 at 001; CX0323 at 001; CX0324 at 001; CX0325 at 001; CX0326 at 001). The Board sent the letters to induce the malls to refuse to rent space to non-dentists teeth whiteners. (CX0560 (Feingold, Dep. at 199-200); CX0581 (Bakewell Dep. at 259-264, 266-277); CX0562 (Friddle, IHT at 72, 75-76)). The letters are categorical: all non-dentist teeth whitening is unlawful. (CX0565 (Hardesty, Dep. at 215-216); CX0203). Hull Story Gibson Companies, an owner and operator of malls in North Carolina and elsewhere, received one of these letters. Mr. John Gibson, Chief Operating Officer of HSG, understood the Board's position to be that non-dentist teeth whitening would be a violation of North Carolina law. (Gibson, Tr. 629). These letters were part of the extra-judicial campaign to deny actual and potential non-dentist teeth whiteners the means to conduct their businesses. (CX0581 (Bakewell, Dep. at 259-264, 266-277); CX0560 (Feingold, Dep. at 199-200); CCPFF ¶¶ 330-350, 640-649).

In addition, after one Board member realized that many of the non-dentist teeth whitening complaints were against salons and spas regulated by the North Carolina Cosmetology Board (CX0565 (Hardesty, Dep. 231-233, 236)), the Dental Board contacted the Cosmetology Board to enlist its assistance in stamping out this competition. (CX0566 (Hardesty, IHT at 115-116); CX0056 at 005; CX0067 at 001-002; Hardesty, Tr. 2861-2864). The Board convinced the Cosmetology Board to warn cosmetologists that "only a licensed dentist or dental hygienist acting under the supervision of a licensed dentist" may provide these services and that the "unlicensed practice of dentistry in our state is a misdemeanor." (Joint Stipulations of Law and Fact ¶ 33).

From the outset of its campaign against non-dentist teeth whitening, the Board has broadly interpreted the statute to prohibit acts that bear little, if any, resemblance to the practice of dentistry. The Board has sought to exclude businesses where the teeth whitening is done almost exclusively by the customer; for example, that an operator simply offers instructions on how to use an OTC product is sufficient to draw a Cease and Desist Order from the Board. (CX0100 at 001 (condemning the provision of assistance)). In fact, the Board's industry expert testified that a CVS clerk that directed a customer to aisle seven with a recommendation of Crest White Strips, would be engaged in the unlicensed practice of dentistry. (Haywood, Tr. 2640). While the Board has not adopted its expert's view; if such a view were implemented in North Carolina, that clerk would have committed a misdemeanor.[7] (CCPFF ¶ 316, 840-841).

Among the range of potential enforcement options available to the Board – progressing from no enforcement, to touching of the mouth is prohibited, to any assistance at all crosses the line – the Board has almost always chosen this last most exclusionary interpretation. (CX0041 at (Aug. 10, 2004) (can't "danc[e] around this issue by keeping their fingers out of the mouths of their clients"); CX0523 at 001 (Feb. 12, 2008) ("prohibition remains the same even if the customer inserts the whitening tray themselves"); CX0424 at 001 (March 31, 2010) ("[P]ositioning a non-dentist between the product manufacturer and the consumer as a facilitator (advisor, enabler, instructor, and someone who ultimately judges that it is OK to use the product) . . . constitutes the practice of dentistry in NC."). Even where the Board knew the process was entirely self-applied, the Board ordered operators to cease and desist. (Valentine, Tr. 566-567).

[7] The Board together with other North Carolina dentists have discussed making such conduct a felony. (CX0566 (Hardesty, Dep. at 116); CX0056 at 005).

(CCPFF ¶ 670).

One particular dentist, Dr. Owens, was the Case Officer on far and away the greatest number teeth whitening cases. Dr. Owens was assigned, or assigned himself, over 18 cases. (Owens, Tr. 1445, 1605). At the same time, Dr. Owens' practice had garnered significant teeth whitening revenue compared to other Board members. (CX0467 at 001). Dr. Owens did not think that serving as case officer created any conflict. (Owens, Tr. 1573). Dr. Owens often sent out C&D letters within minutes or hours of receiving notice of a complaint, and often without any investigation. (CX0297 at 001 (Dec. 1, 2008) (Dr. Owens authorized cease and desist 12 minutes after being assigned case); CX0311 at 001 (Dr. Owens authorized cease and desist same day as receiving assignment); CCPFF ¶ 266).

H. The Board's Anticompetitive Conduct Predictably Leads To Raised Prices And Reduced Consumer Choice

1. Economic Theory And Studies Show Likelihood Of Anticompetitive Effects

The testifying expert economists agreed that an exclusionary model was the correct theoretical framework to use to analyze the conduct. Professor Kwoka and Professor Baumer also agreed as to the implications of this model: exclusion of a new low cost provider will result in loss of consumer welfare in the absence of a valid efficiency justification.

Professor Kwoka explained: "In the pre-exclusion time period, consumers [sort] themselves amongst these alternatives and producers offering whichever ones are justified by their cost and market demand, at the end of that process we have what in economics is an equilibrium. That is to say, all consumers have moved to their preferred alternative, all suppliers are producing cost-effectively what consumers wish, and there's no further movement or

migration on the part of any consumers between alternatives. They've already made their first best choice." (Kwoka, Tr. 1006; CX0654 at 009-010; Baumer, Tr. 1726-1727, 1763; CCPFF ¶ 551).[8]

In the absence of an efficiency justification, consumers are deprived of the benefits that would accrue from competition between incumbents and recent entrants. Some consumers are denied their provider of choice and switch to higher priced dental services or more time consuming OTC products. Consumers who already use dental providers will pay higher prices. And some consumers will leave the market altogether. This is "straightforward" "Econ 101." (Baumer, Tr. 1726-1727, 1763, 1781, 1817; Kwoka, Tr. 1007, 1019-1020, 1022-1023; CCPFF ¶¶ 559-560, 1335).

Experience and economic studies teach that the theoretical anticompetitive effects from exclusion occur across all markets, including markets involving health care professionals and state licensing boards. Professor Kwoka demonstrated that the economic literature is replete with empirical studies confirming that licensing boards have acted to benefit their constituents, with corresponding harm to consumers. (Kwoka, Tr. 1040-1041; CX0631 at 012). The studies found anticompetitive restrictions in numerous and varied occupations, including dentists,

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[8] In terms of societal resource allocation, the movement toward non-dentist teeth whitening is efficient. In many professions, there is migration of treatments that become standardized to lesser trained professionals, such as eye examinations moving from opthamologist to optician and x-rays from radiologist to technician. Here, teeth whitening migrated from the dentist to the wholly untrained consumer first, then an intermediary. (Kwoka, Tr. 982-984). Dr. Baumer agrees with Nobel Prize winner Kenneth Arrow that there is a societal cost to insisting on provision of services only by the highest qualified provider (e.g., a dentist). (Baumer, Tr. 1966-1967) ("costly physician time may be employed at specific tasks for which only a small fraction of their training is needed and which could well be performed by others less well trained and therefore less expensive.")

lawyers, optometrists, veterinarians, real estate agents, plumbers, and electricians. (Kwoka, Tr. 1036-1037). Further, as Professor Baumer observed, "Virtually every board . . . has a 'material interest' in excluding non-professionals from practicing." (RX0078 at 002, 008, 017). The studies confirm that the anticompetitive conduct does not cease simply because the professionals take an oath to protect the public. (Baumer, Tr. 1326-1327; Kwoka, Tr. 1111-1112). (CCPFF ¶¶ 569-627, 1335).

The studies generally looked at three major categories of restrictions: (1) whether states have reciprocity with other states in licensing; (2) the states' use of high fail rates on licensing examinations to control the flow of new practitioners into the state; and (3) restrictions on the form of practice, such as the number of offices a professional might own or whether the professional can be employed by a nonprofessional. (Kwoka, Tr. 1037-1038). The restrictions were often adopted at the behest of the incumbent providers of these professional services. (Kwoka, Tr. 1038). As here, these restrictions were defended as being in the public interest or in the interest of the consumers of the profession involved in the restriction. (Kwoka, Tr. 1038, 1048; Baumer, Tr. 1852; CCPFF ¶ 578-580).

These studies generally conclude that these restrictions had the effect of increasing the price of services within the states with the most stringent restraints. (Kwoka, Tr. 1041). The studies do not find any systematic benefits in quality to consumers due to the restrictions. (Kwoka, Tr. 1041; CX0654 at 017-018; CX0631 at 012; CCPFF ¶ 587).

Some studies focused specifically on restrictions in dentistry. Like the other studies, the dentist-specific studies examined (1) reciprocity, (2) restriction on scope of practice dealing with limits on the number of dental hygienists and the functions they can perform, and (3) stringency

of licensing standards. (Kwoka, Tr. 1042). Economists concluded that dental board restrictions on entry by new dentists and scope of practice by dental hygienists have resulted in higher prices without quality benefits. These studies show that exclusionary conduct by dentists and dental boards produces harm similar to that found in studies of exclusionary conduct by other professionals and non-professionals. (Kwoka, Tr. 1046; CX0654 at 015-016; CCPFF ¶¶ 582-587).

Professor Baumer's attempt to downplay the studies' probative value in the current matter was shown to be baseless. He opined that while the studies may have been probative of board conduct in the past, "most" of the bad conduct by Boards had ceased, and therefore the earlier studies were essentially irrelevant. (RX0078 at 014-017). Professor Baumer also maintained that the prior studies all focused on effects from moving from trained professionals to other lesser trained professionals, and that was not the case here. (Baumer, Tr. 1733-1734). Finally, Professor Baumer also asserted that Professor Kwoka is against *all* occupational licensing and that relying on these studies is one indication of Professor Kwoka's extreme views. (Baumer, Tr. 1809-1810). Professor Baumer's critique and characterization of Professor Kwoka views are wholly without merit.

First, Professor Baumer admits that the studies were done properly. He identifies no analytical flaws in the theoretical underpinnings or the empirical findings. In fact, he applauds these studies. (Baumer, Tr. 1896-1897; CX0826 (Baumer, Dep. at 36-37)). Further, there have been no studies in recent years that challenge this conventional and consensus view. (Kwoka, Tr. 1054-1055, 1120-1121; CX0631 at 012-013; CCPFF ¶ 574-577, 600, 1335).

Second, even if some of the studies are "old," others are of recent origin. For example,

Professor Baumer admits that one recent study by Kleiner and Kudrle is not too old. (Baumer, Tr. 1971-1972). The Kleiner and Kudrle study, published in 2000, examined whether stringent licensing standards were simply a barrier to entry for new dentists for the benefit of incumbent dentists, or whether the stringent standards had the purpose and effect of assuring consumers about the quality of new dentists. The study collected both price data and data on dental outcomes, such as for untreated dental deterioration. The study found that states with the most stringent licensing standards had prices of dental visits 11% higher than states with low licensing stringency. The study also found that the greater licensing stringency produced no incremental benefits in terms of dental health. (Kwoka, Tr. 1044-1046). Professor Baumer admits that the study found that individuals from states with more restrictive dental practice provisions had greater untreated dental problems than individuals from states with less restrictive provisions. (Baumer, Tr. 1971). Indeed, Professor Baumer testified that he has no reason to criticize the Kleiner and Kudrle study. (Baumer, Tr. 1971).

More importantly, Professor Baumer himself relied on these studies in connection with his 2007 article relating to the use of the internet to obtain prescription drugs. (Baumer, Tr. 1901, 1903). Professor Baumer conceded that as of the time of the 2007 article, he believed that the studies were valid and that occupational licensing boards often served as protectionist bodies improving the private interest of those regulated. In this article, Professor Baumer noted his concern that pharmacy boards could be engaging in anticompetitive activity that resulted in consumer harm, and that the actions of the pharmacy boards could simply be disguising "economic protectionism." (Baumer, Tr. 1903; CX0826 (Baumer, Dep. at 191-192)). Although boards in many instances protect consumers, Professor Baumer agreed that "self-regulation

could also be used to insulate the licensed professionals from competition . . . ." (Baumer, Tr. 1902; CX0826 (Baumer, Dep. at 194) (citing one authority who remarked that "contemporary state licensure justifies local professional fiefdoms, perpetuates parochialism, and encourages anticompetitive protectionism"); CCPFF ¶¶ 577-578).

His reliance on the studies in 2007 is consistent with his view that occupational licensing boards still engage in some forms of anticompetitive conduct. (Baumer, Tr. 1898, 1901; CX0826 (Baumer, Dep. at 39, 136, 211-212)). It was not until after he was engaged to testify for the Board that his view of the earlier studies morphed. And even so, when asked at trial whether he was prepared to repudiate his 2007 reliance on those studies in his own academic work, Professor Baumer said "no." (Baumer, Tr. 1908-1910).

Professor Baumer also incorrectly maintains that the prior studies are distinguishable because they analyzed entry restrictions on lesser but still trained professionals, and here the operators are untrained. Professor Baumer admits that, even where the new product was to be provided by a lesser trained professional, the incumbent professionals imposing the restraints used the exact same justification - the potential competitors were woefully underqualified and threatened the health and safety of consumers. (Baumer, Tr. 1852, 1916-1917). Professor Baumer admits that such a justification is often a smokescreen (CX0826 (Baumer, Dep. at 65-66)) and that in many cases the health and safety justifications proffered by the boards turned out to be false. (Baumer, Tr. 1852-1853). In fact, with respect to reciprocity restrictions, based on these prior studies Professor Baumer testified that "it would be prudent to maintain healthy skepticism, given the history and the conditions there." (Baumer, Tr. 1916-1917; CCPFF ¶¶ 605-609, 1335).

Moreover, one study did examine harm caused by the exclusion of non-licensed dental assistants; more importantly from an economic perspective, the salient fact is that there has been exclusion – harm follows from exclusion regardless of whether the excluded group is licensed or unlicensed. (Kwoka, Tr. 1050-1051; CX0631 at 013). In fact, many boards studied based their exclusionary conduct on the fact that using the "other" licensed occupation (e.g., dental assistant) was unsafe. (Kwoka, Tr. 1041, 1043-1044; CX0631-009). Further, the exclusion here also applies against hygienists and dental assistants (Jt. Stip. Law & Fact ¶¶ 33, 35-36; CX0056 at 005), which even Professor Baumer would concede makes the studies on par with one another. (Baumer, Tr. 1969; CCPFF ¶¶ 583-586, 597, 1335).

Professor Baumer testified that Professor Kwoka's use of the studies was one of several facts purportedly exposing Professor Kwoka as an extremist engaging in a broad-based challenge of occupational licensing. (Baumer, Tr. 1871). At trial, each of Professor Baumer's bases was undermined. As just noted, Professor Baumer himself endorsed these studies right up until the time he was "engaged" by the Board. Second, when pressed to identify anything in the Kwoka report or testimony that indicated a desire to abolish boards, Professor Baumer was unable to identify anything other than the "gestalt" of the report. (Baumer, Tr. 1871-1878). For example, he cited the following as evidence of Professor Kwoka's anti-board position: "on the first page of his report, he says, "[t]he board represents licensed dentists in North Carolina, who have a material interest in prohibiting teeth whitening by non-dentists." Professor Baumer then admitted that he himself had testified to the same point, and "corrected" himself. (Baumer, Tr. 1875; CCPFF ¶¶ 152, 539, 616-618, 1335).

Further, Dr. Baumer has not staked out a position that all anticompetitive conduct has

been stamped out; instead, he agrees that anticompetitive conduct undertaken by the healthcare professional boards in the 1970s and 1980s still "certainly does occur," and that there is "absolutely" "continuing potential for abuse by state boards." (Baumer, Tr. 1898, 1901; CX0826 (Baumer, Dep. at 39, 136, 211-121)). The licensing board restrictions existing today are generically similar to those studied in the past, even if there may be some differences. (Kwoka, Tr. 1122-1123). In fact, the Board's exclusion of non-dentist teeth whiteners is even more restrictive than the practices examined in the studies of other professions. (Kwoka, Tr. 1051-1053, 1123). Those studies examined restrictions that were narrower in scope than outright exclusion, but the same harm found in those cases – raising the price of the service without a quality benefit to the consumer – will result from outright exclusion as well. (Kwoka, Tr. 1051-1053, 1123; CCPFF ¶¶ 599, 604-606, 1335).

The studies discussed by Professor Kwoka provide a strong foundation for a presumption that exclusionary conduct by a dental board is anticompetitive. (*See also* Baumer, Tr. 1982 (agrees that economists can learn from other types of exclusionary conduct to make inferences about new exclusionary conduct)). The type of horizontal restraint at issue here is presumed in economics to be anticompetitive absent some compelling justification because the restraint necessarily results in a decrease in total consumer surplus. (Kwoka, Tr. 1009-1010, 1195; CCPFF ¶¶ 544-568).

2. Evidence Shows Actual Anticompetitive Effects

As the theory and studies would predict, the Board's anticompetitive conduct resulted in substantial anticompetitive effects. Professor Kwoka detailed five types of harm to consumers:

> (a) the loss of an innovative product alternative favored by some segment of consumers,

(b) the higher price paid by some prior consumers of kiosk/spa teeth whitening who now shift to dentist provision,

(c) the smaller consumer surplus realized by prior consumers of kiosk/spa teeth whitening who shift to less-favored OTC strips,

(d) the loss of consumer surplus by consumers of kiosk/spa teeth whitening who now simply do not purchase teeth whitening services at all, and

(e) the higher price now faced by some former consumers of dentist teeth whitening as a result of the increased demand for that service.

(CX0631 at 014; Kwoka, Tr. 1008-1014; CCPFF ¶¶ 681-710).

The Board's campaign to shut down non-dentist teeth whitening operations in North Carolina met with considerable success. Numerous teeth whitening operations closed; others pared back operations and advertising. (*E.g.*, CX0347 at 001 (Jan. 16, 2008) (Amazing Grace Day Spa stopped offering teeth-whitening after receiving a cease and desist letter); CX0622 at 003 (July 16, 2007) (Champagne Taste/Lash Lady no longer provided teeth whitening services after being sent a cease and desist letter); CX0623 at 003-004 (Feb. 29, 2008) (Savage Tan no longer offered teeth whitening after being sent a cease and desist letter); CX0162 at 001 (Feb. 9, 2009) (Modern Enhancement salon would "no longer perform this service as per your order to stop and will no longer perform whitening services unless told otherwise by the NC Board of Dental Examiners."); CX0814 at 001 (Aug. 31, 2010) (Savvy Salon shutting down because non-dentist teeth whitening declared unlawful); CX0815 at 001 (Triad Body Care shutting down due to Board); CX0050 at 001 (March 27, 2007) (Nicole's Hair Salon shutting down).

Trial witnesses also testified to the effects of the Board's campaign. Mr. Wyant, who testified at trial, operated One Bright Smile from December 2007 to January 2008. He had been very successful: his operation served approximately 400 customers and generated between

$35,000 and $40,000 in revenue. One Bright Smile was attracting people to Carolina Place Mall, and the mall had been very pleased with this teeth whitening business. (Wyant, Tr. 873-875). After the mall in which he operated received a letter from the Board, he was forced to leave. (Wyant, Tr. 876-884). Mrs. Hughes, owner of SheShe Spa, testified that since receiving a Cease and Desist Order from the Board in July 2007, her salon limited its teeth-whitening services to "family members and friends that I know very well. I just don't feel comfortable advertising or offering it to anyone else." (Hughes, Tr. 947, 950-951; CCPFF ¶¶ 344-344-347, 635, 638, 640-641, 647).

The Board's letters to the malls had their desired effect. As a result of these letters, operators of at least seven malls in North Carolina either terminated or refused to lease space to non-dentists intent on operating teeth whitening facilities. Mr. Gibson, an attorney and CEO of Hull Story Gibson, testified that his management company was no longer willing to lease space to non-dentist teeth whitening operations after being informed by the Board that such operations were unlawful. (Gibson, Tr. 633). HSG owns and manages five malls in North Carolina: Blue Ridge Mall in Hendersonville, Cleveland Mall in Shelby, Carolina Mall in Concord, New Bern Mall in New Bern, and Wilson Mall in Wilson. (Gibson, Tr. 613-614; CX0255 at 001-002 (email from Cathy Mosley, Manager of Hull Storey Retail Group LLC, dated Mar. 21, 2008) (kiosk lease applicant must provide "proof" that the Board "will approve" teeth whitening process); CX0525 at 001 (e-mail from Cathy Mosley, Mar. 21, 2008) (same)). Similarly, Simon Malls decided not to lease after receiving the mall letter. (Wyant, Tr. 881-884; CX0629 at 002). Other malls also declined to lease. (Wyant Tr. 881-884, 902-903; CX0629 at 002-003 (Carolina Place Mall in Pineville – managed by GGP); CCPFF ¶¶ 330-350, 640-649).

Sales into North Carolina of teeth bleaching supplies and equipment for use by non-dentist-providers of teeth whitening services have decreased substantially. George Nelson, CEO of WhiteScience, understood the cease and desist orders sent by the Board as "ordering businesses to close. [The Board] issue[s] a cease and desist and they order [non-dentist teeth whitening operations] to close and not to continue on the teeth-whitening business with no other discussion or options . . . . I personally haven't heard and been advised about any type of permitting or other type of option. I've only heard about ordering the close of the business." (Nelson Tr. 850). Mr. Nelson testified that his company's sales reached around $200,000 annually in North Carolina and then, as a result of the Board's actions, "evaporated." (Nelson, Tr. 734-735, 775.) At the retail level, this would be valued at over $1 million in sales. (Nelson, Tr. 734).

James Valentine and Joyce Osborn, CEOs of White Smile and BEKs respectively, gave similar testimony. Mr. Valentine testified that Board opposition resulted in significant delay in White Smile's expansion into North Carolina. Mr. Valentine stated that at its peak White Smile operated in over 60 Sam's Club stores simultaneously in roughly 28-29 states. White Smile averaged $2000 each day it operated in a Sam's Club location, and at good stores could make as much as $3500 to $4000 a day. White Smile's best day revenues from its combined Sam's Club operations was nearly $250,000. (Valentine, Tr. 548-549). Mr. Valentine's company had reached 130 employees; now in part due to the conduct of the Board, there are no employees and his business is almost dead. Mr. Valentine stated that as a result of this delay White Smile likely lost close to half a million dollars in sales revenue. He estimated that White Smile would have performed over 60 shows in North Carolina had it not been for Board opposition, earning a

conservative $25,000 per show in sales revenue. (Valentine, Tr. 546, 568-569). The Board's conduct also dissuaded potential investors from entering into North Carolina. (Valentine, Tr. 563-564).

Similarly, as a result of the Board's actions, Brite White Systems' proprietor, Joyce Osborn, stopped selling her products into North Carolina. Brite White products have not been sold in North Carolina since 2008. (Osborn, Tr. 671-674). But for the Board's actions, Ms. Osborn would again sell the Brite White System in North Carolina. (Osborn, Tr. 674-675; CX0412 at 001 (March 29, 2010 (another large non-dentist teeth whitener, Beyond Dental & Health discussed likely harm from North Carolina position)).

Moreover, the provision of same day teeth whitening in a mall at a relatively low price was a significant service innovation. (Kwoka, Tr. 1011, 1184-1185; Baumer, Tr. 1973). The ability to offer same-day procedures fills a niche in the market. (Kwoka, Tr. 1011; Baumer, Tr. 1974-1975; CCPFF ¶¶ 685-686).

Non-dentist teeth whiteners also innovate with respect to the delivery mechanism. For example, non-dentist teeth whiteners have developed inexpensive trays that are low-cost, convenient, and custom fit to each consumer (the consumer biting into a wax-like impression material built into the tray itself). These trays are a significant departure from the trays commonly used by dentists, which require the taking of alginate impressions, the creation of a model, and the formulation of the tray itself – a procedure that is costly, elaborate, and often literally gag-reflex inducing. (Giniger, Tr. 197-201; Valentine, Tr. 521-523) Their products are not commodities – each of the distributors has invested in R&D to come up with their own unique product. Manufacturers of non-dentist teeth whitening systems consulted with dental

professionals when developing their products and protocols to try and insure that their products were safe and effective. (Osborn, Tr. 651-652, 665-666). For example, Ms. Osborn's Brite White System's LED light obtained 510(k) clearance from the FDA, which states that the "Brite White Teeth Whitening System performs as intended and does not raise any new safety or efficacy issues." (Osborn, Tr. 711; CX0534 at 001-002). These advances are good for the consumers. (Kwoka, Tr. 1184-1185; Baumer, Tr. 1974-1975). In sum, the Board's conduct has removed innovative products from the market and lessened the incentive and ability to innovate due to substantially diminished returns on investment.

The exclusion of non-dentists in the North Carolina teeth whitening market necessarily makes consumers worse off. (Kwoka, Tr. 1008-1010). Consumers whose top choice was non-dentist teeth whitening are forced to choose an inferior alternative, either dentist teeth whitening or OTC strips. (Kwoka, Tr. 1008-1009, 1011-1012; Nelson, Tr. 739-742; Valentine, Tr. 552-553; Osborn, Tr. 662-664; CX0643 at 001). Prior to the exclusion, these consumers chose non-dentist teeth whitening because they preferred a cheaper alternative to dentists and a quicker alternative to OTC strips, but after exclusion those characteristics are not available to them. (Kwoka, Tr. 1181-1182). Consumer satisfaction with non-dentist teeth whitening was high. (Giniger, Tr. 322-323; Wyant, Tr. 880; Valentine, Tr. 556-557 (Sam's); Nelson, Tr. 736-737; Osborn, Tr. 661-664; CX0489 at 044). Dr. Giniger has administered numerous consumer satisfaction surveys on teeth bleaching and has observed that most people who undergo the procedure are satisfied with the result. (Giniger, Tr. 322-323, 345; CX0576 at 005). Dr. Giniger explained that at its core, non-dentist providers of teeth bleaching services offer consumers value propositions that many consumers want. (CX0632 at 022). Mr. Wyant testified

that only one out of about 400 customers expressed dissatisfaction, and consequently, did not have to pay. (Wyant, Tr. 880). In fact, the Board is unaware of more than a handful of consumer complaints regarding non-dentist teeth whitening. (Respondent's Response RFA ¶ 18).

Consumers who want quick results now must make an appointment with a dentist. For some consumers, in order to maintain affordable prices, they will forego the same day whitening and opt for the low cost OTC products. Still other consumers drop out of the market entirely. (Kwoka, Tr. 1012-1013). Moreover, even consumers who favored the dentist over salons are harmed. The lack of competition permits dentists to maintain price above what it would have been with competition. Indeed, Professor Baumer concedes that consumers will suffer from loss of convenience and higher prices. (Baumer, Tr. 1726-1727, 1841; CX0826 (Baumer, Dep. at 122-123)); CCPFF ¶¶ 681-690).

Professor Baumer testified as to his belief that consumer harm may be concentrated on the poor and the young. (Baumer, Tr. 1730; CX0826 (Baumer, Dep. at 106)). Even if true, that demonstrates harm nonetheless.

I. The FTC Has Jurisdiction Over The Board And Its Conduct

As part of its *State Action Opinion*, the Commission conclusively determined that the Board was subject to FTC Jurisdiction. *State Action Opinion* at 5-6.

J. The Challenged Conduct Affects Interstate Commerce.

The Board's conduct affected a substantial amount of interstate commerce. The Board sent letters to out-of state non-dentist manufacturers, mall operators; and potential non-dentist teeth whiteners. These out-of-state entities accounted for millions of dollars of sales in North

Carolina. (Valentine, Tr. 546, 582, 568-569; Nelson, Tr. 734; Osborn, Tr. 674-675; Gibson, Tr. 632-633; CX0204 at 001; CX0261 at 001). Out of state distributors testified to millions in lost sales attributable to the Board's conduct. (CCPFF ¶¶ 657-658; *see also* ¶ 674).

K. The Board's Anticompetitive Conduct Has No Offsetting Efficiency Justifications

The Board has not proffered a cognizable or valid efficiency justification. As discussed below, the Board's particular "public safety" defense is not cognizable under the antitrust laws. Even if it were, however, merely asserting an efficiency is not sufficient. Historically, boards have used safety as a "smokescreen" for anticompetitive conduct. (CX0826 (Baumer, Dep. at 65-66)). This particular public safety defense is not supported by the facts.

Here, the record shows that non-dentist teeth whitening is safe relative to other means of teeth whitening, and in absolute terms. In fact, salon teeth whitening is likely safer than other types of teeth whitening. All methods use the same active ingredient, hydrogen peroxide. The in-office dentist treatment uses the highest concentration, and may pose the greatest risk to consumers both in the short and long run. In the office, unlike the salon, the gums must be protected from the highly concentrated hydrogen peroxide solution. Further, even if there were a cognizable and valid health and safety "justification," there are ways to achieve any legitimate objective that are less restrictive than a total ban of non-dentist teeth whitening.

1. Dr. Martin Giniger Credibly Dispelled The Board's Argument That Non-Dentist Teeth Whitening Poses Health Risks

Dr. Martin Giniger is a licensed dentist, having obtained a doctor of dental medicine with honors in 1984. Dr. Giniger also has an MsD in Oral Medicine (1993), and a PhD in Biomedical Science (1993), with a specialization in oral biology. (Giniger, Tr. 78-79). In the area of teeth

whitening, he has taught at prestigious dental schools, published in peer reviewed journals, conducted clinical studies, received prestigious awards and grants, consulted with major manufacturers such as Proctor & Gamble, Johnson & Johnson, and Discus Dental, helping to develop extremely successful products, and received numerous patents. (Giniger, Tr. 88-99). Dr. Giniger is one of the world's foremost experts on teeth whitening. (CCPFF ¶¶ 774-795).

In formulating his opinions in this matter, Dr. Giniger reviewed the documents produced by the Board and by third parties. (Giniger, Tr. 106-107). He also conducted an extensive review of the relevant scientific literature, including the materials referred to in Dr. Haywood's Report, and also drew on his extensive knowledge and expertise in the field of oral care and teeth bleaching. (Giniger, Tr. 106-107). The information and opinion evidence provided by Dr. Giniger were well-supported and credible, and should be given great weight.

Dr. Giniger testified to a complete absence of evidence in the literature that vital teeth bleaching by non-dentists poses material risks to consumers greater than those posed by similarly engaged dental professionals. (Giniger, Tr. 267-268; CX0653 at 044). Teeth bleaching, by whomever provided, is safe and effective, and there is no evidence that non-dentist teeth bleaching poses a greater risk than dentist teeth bleaching. (Giniger, Tr. 121-123, 278-279; CX0653 at 005, 046; CCPFF ¶¶ 716-721).

Over the last 20 years, millions of consumers have safely bleached their teeth without dental involvement and there is not a single study demonstrating substantial, non-transient harm from non-dentist teeth bleaching or OTC products. (Giniger, Tr. 121-123, 430-431, 453-455; CX0653 at 005; Haywood, Tr. 2729). In fact, the availability of non-dentist-provided teeth bleaching may contribute to dental health by increasing consumer appreciation of oral health and

hygiene. (Giniger, Tr. 124).

The most common side effects from bleaching of vital teeth are dentinal hypersensitivity and gingival irritation; however these side-effects are very transitory and of no clinical significance. (Giniger, Tr. 214; CX0653 at 026-027; Haywood Tr. 2711). In any event, where dentinal or gingival discomfort requires treatment, it responds to simple measures including taking of NSAIDs, use of desensitizing gels, and, most importantly, discontinuing the bleaching regimen, at least briefly. (CX0653 at 027; Giniger, Tr. 215-216). Moreover, dentists are generally unable to predict such sensitivity. (Hardesty, Tr. 2814; Wester, Tr. 1369; CCPFF ¶¶ 929-930).

More serious purported health issues have no clinical or other foundation. There have been no reports of allergic reactions or anaphylactic shock. (Haywood, Tr. 2729; Giniger, Tr. 355-356; Hardesty, Tr. 2818).

Dr. Giniger thoroughly debunked Respondent's wide-ranging assertions of potential and actual harm, making the following points:

- clinical studies have demonstrated the safety of hydrogen peroxide at levels used by non-dentists and over-the-counter products
- "tens or hundreds of millions of people who have undergone teeth bleaching and not one scientific report, not one." "Not one published incident ever -- ever -- of any harm" (Giniger, Tr at 279, 123).
- purported risks to enamel unsupported by credible evidence
- purported risk of allergic reaction
- studies performed or relied on by Dr. Haywood, the Board's industry expert, are either flawed or misinterpreted
- he is "a hundred percent sure" that the single report of actual harm due to non-dentist teeth whitening reported by the Board (the Runsick allegation)

is unrelated to bleaching performed four days before onset of symptoms (Giniger, Tr. at 275-276).

As discussed below, Dr. Giniger thoroughly discredited Dr. Haywood's testimony. In particular, Dr. Giniger demonstrated that Dr. Haywood's concern with masking had no reasonable basis. Masking would be a problem if teeth whitening resulted in a dentist missing a pathology that then caused otherwise unremediable harm to a patient. Dr. Giniger testified to 15 separate, independent events that would have to occur before masking due to non-dentist teeth whitening could have clinical significance. The unlikelihood of such a sequence is buttressed by the fact that Dr. Haywood could not identify one case report involving masking. (CCPFF ¶¶ 993-995).

2. Dr. Haywood's Testimony Is Flawed And Not Credible

Dr. Haywood is the co-developer of the take-home teeth whitening process used by dentists. He has demonstrated an ongoing "liberality of thought" when promoting nightguard vital bleaching, the technique he co-developed, but is not so forgiving when analyzing any product or method that might compete with his preferred technique. For example, Dr. Haywood early on insisted that the absence of evidence of harm from dentist-provided nightguard vital bleaching is ample evidence of its safety; but he also insists, most vociferously, that the absence of evidence of harm from non-dentist-provided teeth bleaching, despite millions upon millions of applications, is meaningless. (Haywood, Tr. 2590-2593). Dr. Haywood admits to knowing little about non-dentist-provided teeth bleaching products and practices, and (despite his retention in this matter) has no interest in learning more because, he says, non-dentist providers are quacks and charlatans and what they are doing is simply wrong. (Haywood, Tr. 2645-2650, 2748). They

are bad people doing bad things because Dr. Haywood, unburdened by facts, says so. Dr. Haywood does not save his animus for small business people alone. He repeatedly, but again with no evidence other than his say-so, asserted that large OTC teeth whitening product manufacturers, like P&G, were impelled by the demands of commerce to market ineffective and harmful products. Indeed, he claimed that a P&G representative told him that P&G knowingly sold an ineffective paint-on teeth whitening product, the better to compete with a paint-on Colgate teeth bleaching product. Unfortunately for Dr. Haywood, Colgate brought a lawsuit challenging the effectiveness and superiority claims of that very P&G product in P&G's advertising, but the product was found to be effective by a unanimous jury. (Haywood, Tr. 2624; *Colgate Palmolive v. Proctor & Gamble*, 03-CV-9348 (Docket #40, Judgment dismissing complaint)). Indeed, Dr. Haywood's conduct and testimony repeatedly demonstrate his abiding interest in nightguard vital bleaching and his lack of objectivity on matters affecting the prestige and position of dentist provided nightguard vital bleaching among teeth whitening alternatives. If that were not enough, Dr. Haywood also views the question of whether non-dentists may provide teeth bleaching services or assistance as a wedge issue in dentist control of areas traditionally within the ambit solely of dentists. (Haywood, Tr. 2632). His testimony relating to potential harms from teeth whitening is entitled to no weight.

- Dr. Haywood reached mutually inconsistent opinions: teeth whitening by non-dentists wastes consumers money because it is ineffective and yet is so effective that a dentist could be fooled into not noticing that a damaged tooth has been bleached.

- Dr. Haywood mischaracterized two EU studies to support the use of his nightguard vital bleaching method for children, and for the long term. The EU in fact concluded that a lack of evidence existed to support bleaching for children. The EU in fact concluded that Dr. Haywood's study, using only 9 patients, was insufficient to support long term use.

- Incredibly, Dr. Haywood testified that it would be irrelevant to him if there were 500 million uses of non-dentist teeth whitening without reported harm. He testified that virtually no amount of data could convince him of the safety of non-dentist teeth whitening. He discounted the absence of reports of harm from any of the states permitting non-dentist teeth whitening.

  Q: You acknowledge that you've created a catch-22 where that would perpetually bar non-dentists from providing teeth whitening even if it were true in fact that that was perfectly safe?

  A. That's exactly what I believe, yes, sir. (Haywood, Tr. 2730).

- Despite being a paid consultant for the ADA on teeth whitening and a retained expert in this matter, Dr. Haywood never contacted the ADA to determine whether the ADA request for complaints had turned up anything.

- Dr. Haywood compared non-dentist teeth whitening to "assisted suicide," "abortion," "jumping out of a plane without a parachute," and people walking across the street without looking, as well as the infamous Tuskeegee syphilis study.

- Dr. Haywood testified that dentists must make a stand with teeth whitening or their profession is in jeopardy.

- Dr. Heymann, Dr. Haywood's co-inventor of the Night Guard Vital Bleaching method, has written that Dr. Haywood's opinion that dental supervision was required before teeth whitening neglects abundant, credible scientific evidence and is wrong.

- P&G, traditionally aligned with dentists, characterized the view of Dr. Haywood and the ADA that dental supervision was necessary, as based on shoddy science and motivated by commercial interests.

(CCPFF ¶¶ 819-825, 836-838, 846-847, 851, 855, 893, 906, 1000, 1004, 1027, 1029, 1031; CX0496; CX0497 at 005; *see also* Haywood, Tr. 2712).

Because of Dr. Haywood's positional bias and lack of analytical rigor, his testimony is not credible and his opinions should be disregarded. (CCPFF ¶¶ 800-906).

3. Unrebutted Testimony Of Distributors And Operators Shows That No Harm Has Occurred

Five industry participants testified as to the safety record of non-dentist teeth whitening. Mr. Valentine, Mr. Nelson, Ms. Osborn, all manufacturer/distributors, testified that their products had an impeccable safety record. (Valentine, Tr. 600; Osborn, Tr. 664-665; Nelson, Tr. 736). A non-dentist operator, Mr. Wyant, testified that his operations experienced no safety issues. (Wyant, Tr. 880). Ms. Osborn testified that she had never received a report that consumers of her teeth whitening product had reported any safety issues. (Osborn, Tr. 664-665). Mr. Nelson, whose company has accounted for over a million procedures, testified that his company had not received a single claim against its insurance policy and not a single complaint of serious harm. (Nelson, Tr. 736, 771). And Mr. Valentine testified that the only claim received by White Smile, out of over 100,000 teeth whitenings, related to gum sensitivity. (Valentine, Tr. 560-561). The Board's response has been to proffer hypothetical, unsubstantiated allegations. (CCPFF ¶ 734-735, 844-853, 868, 869).

4. Non-Dentist Teeth Whitening Has Equal, If Not Superior, Safety Characteristics To OTC And Dentist Provided TW

Various factors indicate that whitening in a salon or kiosk is, if anything, likely to be safer than dentist or OTC teeth whitening. It is acknowledged that the higher the concentration and the more acidic the peroxide, the greater the risk of dentinal sensitivity and gingival irritation. In-office dentist whitening uses a higher concentration of peroxide, generally requiring a more acidic solution, both of which increase the risk of sensitivity and harm. In-office dentist whitening may use lasers or other high intensity lighting that produces greater heat, with resulting potential for pulpal injury; but LED lights, the only kind of light used by non-

dentist-providers, are inherently cool. (Giniger, Tr. 186-187, 192, 213-215; CX0653 at 027, 038-044; Haywood, Tr. 2710). Further, there is more possibility of overuse from a dentist take-home kit or an OTC product than a one-time or occasional salon visit. As Mr. Valentine observed, "an eight-year-old can walk into a Walgreens and go buy Crest Whitestrips and use them every day for the rest of their life with no action from the dental board . . . ." (Valentine, Tr. 599-600).

5. Sanitation Is Used As A Pretext

Testimony by Board witnesses that sanitation issues justify shutting down non-dentist teeth whitening is unsubstantiated at best. Although dentists testified that salons were unsanitary, they admitted they had no basis for this testimony. The Board has never conducted a systematic assessment of sanitation and infection control measures taken by non-dentist teeth bleaching establishments. (Hardesty, Tr. 2822). In fact, the sanitation standards for salons in North Carolina are strict, detailed, and voluminous. Salons are inspected for compliance regularly. As such, salons are subject to stricter requirements and enforcement than dental offices. (Nelson, Tr. 849; Wester, Tr. 1416; Owens, Tr. 1665; *compare* CX0828 at 001 (Board sanitation rules) *with* CX0827 at 001-006 (Cosmetology Board sanitation rules)).

To minimize issues of sanitation (as well as run-ins with dental boards), manufacturers have increasingly designed products for use by non-dentist bleaching facilities that are in sterile, pre-packaged single-use containers meant to be self-applied by the consumer. (Giniger, Tr. 262-263; Valentine, Tr. 521-522; Osborn, Tr. 655; Nelson, Tr. 757-758; CX0653 at 036-037). In addition, non-dentist-provided teeth bleaching protocols describe and require sanitation and infection control procedures that include disinfection, and other measures, including donning

fresh gloves for each customer (likely using the same non-sterile gloves used in most dental offices throughout the country). (CX0653 at 036-037; Osborn, Tr. 653; Nelson, Tr. 750, 757; Valentine, Tr. 535-541). Moreover, hydrogen peroxide is itself a potent antimicrobial agent and likely helps prevent any possible cross contamination. (Giniger, Tr. 263; CX0653 at 036). Finally, Board members criticized the lack of running water in non-dentist operations, but (1) there was no evidence that running water is necessary, and even it were, (2) the Board members were unaware that the salons had running water, and that mall kiosks had access to running water. (CCPFF ¶¶ 1077-1102).

Despite the proliferation of non-dentist-provided teeth bleaching establishments throughout the country in recent years, no witness could identify any instance, anywhere, of the transmission of TB, hepatitis, or other communicable diseases being transmitted through non-dentist-provided teeth bleaching. (CX0653 at 036; Hardesty, Tr. 2829; Owens, Tr. 1404-1408; CX0565 (Hardesty, Dep. at 145). No witness had so much as read a report that such a thing had happened even at a distant time and place. (CCPFF ¶ 1077).

The dentists themselves do not require extraordinary sanitary or safety measures be taken in conjunction with patients' at-home teeth whitening. Patients are not advised to wear goggles at home. (Wester, Tr. 1366-1367). Dentists do not necessarily advise patients to sterilize the syringe containing bleaching solution before applying it to the tray, nor are patients instructed that their hands should be sterile before handling the tray. And in-office, dentists use gloves, but not sterile gloves. Gloves are used to protect the dental professionals from infections potentially carried by their patients. (Hardesty, Tr. 2781-2782).

In fact, the Board acknowledges that dentist offices sometimes operate under unsanitary

conditions. (Respondent's Response to RFA ¶¶ 32-33). Moreover, the North Carolina Dental Society recently reported that patients may have contracted potential fatal diseases due to microbes accumulating in standing water in dental equipment. (CX0508 at 036; Wester, Tr. 1412 (Dr. Wester agrees that there could be "potential fatal issues in dentist's offices" associated with dental equipment using running water); Owens, Tr. 1671-1672). In short, there is no evidence that sanitation issues in salons are greater than those presented in dentist offices, and may be less. As shown above, the Board's concerns about sanitation are not credible.

Further, the Board could have easily contacted a state or local department of health or other responsible official with a complaint about sanitation or any unhealthful conditions at a non-dental teeth whitening business, but has not done so. (CX653 at 037; CX0555 (Brown, Dep. at 187)). The Board admits that in the event of risk to the public, it would indeed contact a health department, seek assistance from law enforcement agencies, or seek a temporary restraining order. (CX0556 (Burnham, Dep. at 102-103, 166-167)). The Board had ample opportunity to do so. The fact that no such actions were taken confirms the pretextual nature of these arguments.

6. The FDA, Which Classifies Hydrogen Peroxide As A Cosmetic, And Other Government Agencies, View Hydrogen Peroxide As Safe

As noted above, the FDA has always treated hydrogen peroxide as a cosmetic. (CX0646 at 001; CX0532 at 001; CX0630 at 001-002). To qualify as a cosmetic, the product must be "for cleansing, beautifying, promoting attractiveness, or altering the appearance." (CX0630 at 001-002).

Currently, the ADA has petitioned the FDA to change the status of hydrogen peroxide

from a cosmetic to a drug. If the ADA has its way, CWS and other OTC products will require a prescription. That petition, filed in 2009, remains pending. (CX0160 at 001-002). The ADA petition is based on faulty science according to numerous sources.[9] (CX0497 at 001-006 (Dr. Heymann); CCPFF ¶ 1124).

Based upon a review by the Life Sciences Review Office of the Federation of American Societies of Experimental Biology, the FDA has found that hydrogen peroxide is generally recognized as safe (GRAS) for use in the production of various foods. (Giniger, Tr. 213; CX0653 at 025).

The United States Department of Agriculture has determined that hydrogen peroxide is safe and suitable for use in the production of meat and poultry products and may be used in the production of organic crops and livestock. (Giniger, Tr. 211-212; CX0653 at 025). The United States Environmental Protection Agency has authorized the application of hydrogen peroxide to foods as a pesticide. (CX0653 at 025-026).

7. Experience of the Board Members In North Carolina Supports Safety Of Non-Dentist Teeth Whitening

Despite the proliferation of non-dentist teeth whitening in North Carolina, the Board received reports of only two or three instances of consumer harm over a seven year period (Response to RFA ¶ 18; CX0573 (White, Dep. at 52). None of these consumer complains were substantiated. The case of Mr. Runsick, the only one presented in Court, will be discussed below. During this same period, the Board acknowledges that dentists themselves caused harm

[9] The ADA has on occasion changed its views with respect to public health risks. *See* Editorial, *The Effect of Flourine on Dental Caries*, 31 J. Am. Dental Ass'n 1360, 1362-63 (1944) (ADA initially opposed the use of flouride in drinking water).

from teeth whitening. (CCPFF ¶¶ 1055-1059).

The Board is not aware of any study showing that dental teeth whitening is safer than teeth whitening provided at a mall or salon. (Respondent's Response to RFA ¶ 21). Other than the three alleged incidents, Board members testified that they are not aware of any evidence any form (e.g., personal experience, empirical literature) that the practice of tooth whitening by non-dentists has caused any harm other than transient or temporary sensitivity or irritation. (CX0555 (Brown, Dep. at 97); CX0554 (Allen, Dep. at 95-96); CX0560 (Feingold, Dep. at 254); Hardesty, Tr. 2818; CX0570 (Owens, Dep. at 138); Wester, Tr. 1405-1406; CCPFF ¶¶ 735-736, 900-909, 924-930).

Notably, although the Board is unaware of any non-dentist teeth whitening safety concerns, the Board has in its possession reports of the dangers from *dentist* teeth whitening. For example, the Board produced an FDA document reporting:

> Adverse Event Report: Discus Dental Zoom 2 Teeth Whitening System Zoom Teeth Bleaching by Dentist,
> Patient Outcome Other; Disability
> Event Description
>
> > This report pertains to severe bums to the gums during the zoom 2 teeth bleaching system. During the procedure, the uv lamp over my teeth caused intense pain on my upper gums and teeth, which turned red at first. Then the color changed to purple. It has been six days since the teeth whitening procedure and mv gums look pus-like with need for debridement. Of note, the color of my teeth have reverted back to its former color only after 6 days of zoom 2 whitening in the dentist's office.

(CX0535 at 001 (June 4, 2007)). The Board has also identified at least one example of a North Carolina dentist causing non-transitory harm to a patient while performing a teeth-whitening procedure. (Respondent's Response to Interrogatory ¶ 24; Respondent's Response to RFA ¶ 31).

8. Experience Of Other States Supports Safety Of Non-Dentist Teeth Whitening

Several states have permitted non-dentist teeth whitening. In many of these states, the dental boards are subject to disinterested supervision to varying degrees. For instance, in California, "[t]he board which operates under the state Department of Consumer Affairs, found that businesses were not violating state law, because the bleaching agent is far less than prescription strength and the lights customers sit under are similar to a flashlight bulb. Also, operators do not touch the client's mouths . . . ." (CX0488 at 049). In deciding that non-dentists could perform teeth whitening, the Wisconsin Department of Regulation and Licensing General Counsel and the Department of Justice explained:

> Teeth bleaching is markedly different from prophylactic teeth cleaning. It involves the application of a commonly available substance, hydrogen peroxide, to change nothing more than the color of the outer layer of the tooth enamel. This process produces no changes in the texture or structure of the teeth. Whitening is primarily a cosmetic exercise with no significant health implications.
>
> Besides, it is now common for people who are not dentists to whiten their own teeth. Numerous products for that purpose are readily available without a prescription. These products are classified as cosmetics by the Food and Drug Administration. It would be unreasonable to conclude that all these people were guilty of the crime of practicing dentistry without a license by treating or caring for their teeth with a cosmetic for the purpose of whitening them.
>
> There are undoubtedly some who will operate unscrupulous or incompetent commercial ventures which purport to whiten teeth. Those who are harmed by these ventures are not without a remedy even though the operators may not be prosecuted for practicing dentist without a license. Like other consumers who have been harmed by the provision of inadequate or improper services, they may complain to the Office of Consumer Protection for redress.

(CX0651 at 003); *see also* CX0650 at 004 (Tennessee AG rejecting Tennessee Board's position: "In the absence of specific, supporting statutory authority, we do not believe that a Court would uphold an attempt to regulate and characterize – as the practice of dentistry – the application of over-the-counter teeth whitening formulations and the performance of activities incident to such application"); CX0288 at 001 (FDA told Idaho that non-dentist teeth whitening is lawful)).

In Ohio, "[p]roviding a customer with materials to make trays and demonstrating to them how to use them was not necessarily the practice of dentistry, when it was specifically for bleaching." (CX0419 at 001; CX0649 at 001 (Aug. 2006) ("so long as the customer applied the material to his own teeth, and no one else places their hands in the customer's mouth, that the customer can do basically anything they want to their own mouth/teeth."); CX0108 at 042 (Ohio Cosmetology Board); Nelson, Tr. 668 (permissive states)).

The ADA and North Carolina requested dental boards and societies in all states to submit "any reports from people who were injured, burned, whatever using these kiosks." (CX0469 at 002; CX469 at 003-004 ("Dentists Who See Whitening Harm Urged to Report It")). The absence of such a list is telling as it would have been in the interest of North Carolina to submit a list of such incidents to the Court. In fact, Dr. Haywood was a consultant for the ADA and an expert for the Board, yet testified that he did not even request such information from the ADA. This lack of reported harm is borne out by evidence in the record. For example, in response to the North Carolina request, the "LDA [Louisiana Dental Association] has not had anyone call with that sort of complaint." (CX0469 at 002). Similarly, Kentucky reported the absence of consumer harm, where one official noted in August of 2008 that there had been "no complaints of actual harm. I'm not even sure that any patients themselves have actually complained, only

other dentists, etc." (CX0526 at 001).

If non-dentist teeth whitening was systematically harmful there should have been considerably more complaints from consumers to the Board. (Kwoka, Tr. 1078, 1081, 1082-1083; Giniger, Tr. 345-346). Professor Baumer agrees that if there was a health problem with non-dentist teeth whitening he would expect to see, but did not, systematic reporting of such over the years through consumer complaints and through the need for dentists to perform remedial work to repair the damage. (Baumer, Tr. 1962, 1967-1968; CX0826 (Baumer, Dep. at 162); CCPFF ¶ 1223-1224).

Furthermore, the unrebutted testimony shows the absence of harm from non-dentist teeth whitening. For example, Mr. Valentine stated that after 100,000 bleachings he has no reservations about the safety and effectiveness of White Smile provided teeth bleaching. (Valentine, Tr. 547). Mr. Nelson stated that White Science has had over 1 million bleachings without the types of concerns raised by the Board. (Nelson, Tr. 733, 736). Ms. Osborn testified to the same effect. (Osborn, Tr. 664-665). Out of all of these millions of teeth bleachings, the record reflects only one claim against a liability policy, a claim regarding transient gum sensitivity settled for $1200. (Nelson, Tr. 736; Valentine, Tr. 560). Dr. Giniger testified to the tens of millions of whitenings that have occurred without documented harm. (CCPFF ¶¶ 734, 918, 997).

In short, there have been myriad non-dentist teeth whitening procedures throughout the country, as well as a request by the ADA and North Carolina for reports of harm, and yet a complete dearth of reported incidents.

9. Statements By Dental Community That Non-dentist Teeth Whitening Is Safe.

The American Dental Association reported in a July 2010 article entitled *Frequently Asked Questions on Tooth Whitening Safety* that "[w]hether tooth whitening is performed under the care and supervision of a dentist, self-applied at home or in a non-dental setting, whitening materials are generally well-tolerated when used appropriately and according to directions. Tooth sensitivity is not unusual but it normally is self-limiting and resolves." (CX0227 at 005).

The President of the NCDS testified that teeth whitening services are safe for 90% of users. While the remaining 10% may experience some sensitivity, less than 1% would experience a serious side-effect, such as an allergic reaction. Such a reaction could also occur during an in-office dentist teeth whitening. (CX0578 (Parker, Dep. 191-194)).

Many of the non-dentist services have been specifically endorsed and/or used by dentists. For example, the WhiteScience product is endorsed by Dr. Mills, Dr. First and Dr. Verber, and the BEKS system has been endorsed by Dr. Trella Dutton. (Nelson, Tr. 731-733; Osborn, Tr. 658-659; CCPFF ¶ 467).

10. Allusions To HIPAA Violations, Deception, And Lack Of Recourse For Consumers Are All Without Foundation

The Board has thrown together a hodge-podge of other unsupported public safety justifications for its conduct.

Consumer Deception. Without any foundation, the Board has claimed that non-teeth whiteners deceive customers into believing that the teeth whitening is being performed by a dentist or other health care professional. The Board admits it has no basis for this allegation. (Respondent's Response to RFA ¶ 29; CX0566 (Hardesty, IHT at 112); Baumer, Tr. 1951).

Such deception is extremely unlikely. The operators typically provide disclosure

material to their customers which state both that the operator is not a dentist, that the operator is not making any diagnosis, and that the customer should see a dentist if he has any dental concerns before undergoing whitening. (CCPFF ¶¶ 1182-1183).

Common sense also suggests that a "reasonable" customer is not likely to believe the teeth whitener to be a dentist. Much of the whitening occurs in salons by the same individuals that are polishing nails and styling hair. The Board proffered no evidence than suggests that dentists moonlight as cosmetologists, or that consumers believe that to be within the realm of possibility.

Professor Baumer cites the deceptive use of "medical garb" as one of the bases for his opinion that a ban is efficient. (Baumer, Tr. 1934). When pressed on this point Professor Baumer stated that his primary basis for the assumption was that Professor Kwoka had addressed the allegation:

> What I do definitely see is he's [Professor Kwoka] considering that possibility, and -- so if I might use a phrase where there's smoke there's fire. There's been allegations to that effect and he is discussing it. If -- if it wasn't, say, a probability, he wouldn't discuss it. (CX0826 (Baumer, Dep. at 058)).

Professor Baumer then conceded that he, the same as any expert, "would often anticipate what the other side may say and consider it even though I don't believe it is a problem." (CX0826 (Baumer, Dep. at 058). Indeed, that was precisely what Professor Kwoka had done. (CX0654 at 011 ("One Board claim is . . .")). Professor Baumer acknowledged that he had no basis for concluding that consumers had been deceived other than "legal briefs supplied by Allen and Pinnix that allege that this practice could take place" (CX0826 at 056), also clearly an insufficient foundation for an expert opinion. (CCPFF ¶ 1334).

HIPAA. Without any foundation, Board witnesses wildly asserted their concern for " Hipaa" (Health Information Portability and Accountability Act) privacy violations, alleging that the operators were collecting medical information and selling it on the open market. The record is devoid of any evidence that this has occurred, and the Board witnesses admitted as much. In fact, witnesses testified that no such information is gathered, let alone sold. (Nelson, Tr. 824; Valentine, Tr. 594; CCPFF ¶¶ 1130-1132).

Alleged HIPAA violations were a key building block for Respondent's economic expert. (Baumer, Tr. 1951, 1956). The basis for his belief was the Board's Counsel and Counsel's brief - nothing more. (Baumer, Tr. 1951-1952, 1955, 1721). (CCPFF ¶ 1334).

Recourse for Harm. Without any foundation, the Board asserts that non-dentist teeth whitening operators will flee if any customer is harmed and seeks recourse, and that if they do not disappear, they nevertheless will be judgment-proof because they are formed as limited liability corporations.

The record shows that the teeth whiteners and the manufacturer/distributors carry liability insurance, and the places they operate have significant reputations to protect. White Science, in addition to requiring its customers to carry their own insurance, also requires them to pay for a rider on the White Science policy. (Nelson, Tr. 736-737). Brite White requires its customers to obtain product liability insurance. (Osborn, Tr. 702). Mr. Valentine stated that White Smile maintained a $2 million liability insurance policy at the beginning of its relationship with Sam's Club. White Smile later increased its liability insurance to $4 million when it subsequently began operations with the Home Shopping Network. (Valentine, Tr. 560). The record reflects only one claim: a Sam's Club customer against White Smile's liability insurance due to gum

irritation, a claim settled for $1200. (Valentine, Tr. 560). Moreover, malls themselves require kiosk operations to show proof of liability insurance. (Gibson, Tr. 636). And of course malls themselves have a reputation to uphold and do not take on tenants that will endanger their customers. (Gibson, Tr. 621-623; Baumer, Tr. 1929-1930 (malls and Sam's putting "corporate wealth" behind non-dentist teeth whitening cuts against fly-by-night accusation)). Further, salons are not fly-by-night operations existing solely to whiten teeth. The cosmetologists in North Carolina undergo rigorous training and are subject to strict regulation of their main salon business. (Hughes, Tr. 930-931; CX0827 at 001-006 (Cosmetology Regulations)). Salons operating teeth whitening as an additional source of revenue have a lot to lose by harming their customers. As for those operations that have adopted a corporate form, this form is commonly accepted in the business world. And the existence of liability insurance produces a "deep pocket" even if the operator had limited assets in the corporation. (CCPFF ¶¶ 1108-1116).

Finally, Mr. Runsick, the only customer identified as seeking recourse, was able to speak to both the kiosk operator and the owner of the company that supplied the operator with teeth bleaching products and equipment. (Runsick, Tr. 2116-2118).

Ingredients: Knowledge and Safety. The Board asserts that non-dentists do not know the concentration or type of peroxide they use, and that this presents a hazard. As with almost all of its allegations, there was no evidence proffered by the Board in support. In fact, the record reflects that manufacturers provide and require training for new operators. (Valentine, Tr. 536-537, 584; Nelson, Tr. 750; Osborn, Tr. 656). Mr. Wyant, an operator, not only had his questions to WhiteScience answered over the phone, he went to Atlanta and trained with WhiteScience personnel. The training included instruction on the protocol relating to teeth whitening, product

information, and issues relating to documentation, utilizing a consent form, and procedures for safety and cleanliness. (Wyant, Tr. 864-866; CCPFF ¶ 1277).

Further, the precise mechanism for the purported hazard was not set forth. That is, even if were true that an operator did not know the precise concentration of the peroxide, proper use according to the manufacturing protocol is all that is necessary to assure safety. And some Board members had to admit during their testimony that they were not certain whether they used hydrogen peroxide or carbamide peroxide, and/or the concentration of the peroxide. (Owens, Tr. 1622-1623; CX0554 (Allen Dep. at 155); CX0556 (Burnham, Dep. at 146); CCPFF ¶ 981).

The Board further questions the origins of the non-dentists' teeth whitening product, and whether the facilities are compliant with industry and government standards. The unchallenged testimony in the record is that the facilities used meet ISO and/or FDA certification standards. (Nelson, Tr. 738; Osborn, Tr. 711; CX0534 at 001). Mr. Valentine stated that White Smile procures its teeth-whitening products from DaVinci systems in California, a leading seller of bleaching formulations to both dentists and non-dentists. (Valentine, Tr. 520; CCPFF ¶¶ 210, 406, 1125).

MSDS. At trial, the Board enumerated warnings listed on the MSDS (Material Safety Data Sheets) of a non-dentist teeth whitening product, suggesting that the providers did not follow such warnings. These documents "disclose, for being extremely conservative, any contingency that could possibly happen." (Nelson, Tr. 807). Not even the Board's witnesses abide by the letter of the warnings. (Hardesty, Tr. 2816). For example, dentists do not insist that patients change clothing if hydrogen peroxide gets on them even though the MSDS advises to do so. (Hardesty, Tr. 2854-2856). Moreover, it was difficult for one Board member to imagine how

some of the hazards could actually occur. (Hardesty, Tr. 2856).

11. There Is No "Akerloff Lemons" Problem

Professor Kwoka and Baumer agree that there is no "Akerloff" problem in this matter. (CX0654 at 012; Baumer, Tr. 1772-1773). The lemons problem, as formulated by economist George Akerloff, is the concern that information differences between consumers and sellers will result in low-quality products driving high-quality products out of the market. (Kwoka, Tr. 1089-1090). The lemons problem is not an issue because consumers have no trouble distinguishing dentists from non-dentists, and can choose dentists if they believe dentists provide a higher quality product. (Kwoka, Tr. 1090-1091; Baumer, Tr. 1772-1773). That is, there is no danger than inferior products will drive out superior products. (CCPFF ¶ 627).

L. Numerous Less Restrictive Alternatives To A Ban Exist

The Board has taken the extraordinary position that the harm to consumers is limited because dentists are still available to provide the service. That would *not* be viewed as a "less restrictive alternative" to the conduct at issue.

There may be circumstances under which a ban is necessary to protect the health and welfare of the public. (Kwoka, Tr. 1056; CX0631 at 008). For example, there are situations where complete exclusion of a product is appropriate economic policy, such as where the product is "irremediably dangerous." (Kwoka, Tr. 1056; CX0631 at 008). Exclusion of non-dentist teeth whitening might be appropriate where (1) there is convincing evidence of significant health or safety problems, (2) the health and safety problems are inherent in the excluded service, not ancillary, and (3) there are no less restrictive alternatives to outright exclusion of the product. Non-dentist teeth whitening does not meet this standard. (Kwoka, Tr.

1056-1057).

The Board has presented no credible evidence that non-dentist teeth whitening gives rise to any of those situations. (Kwoka, Tr. 1066-1067, 1212). In moments of candor, officials in both the ADA and the NCDS echo the testimony of Dr. Giniger - non-dentist teeth whitening is safe, and certainly as safe as other teeth whitening means. (CX0578 (Parker, Dep. at 191-194); CCPFF ¶ 980).

As a result, for any valid concerns, the Board could advocate for less restrictive alternatives to a ban, even where the Board itself does not have the authority to impose them. (Kwoka, Tr. 1149-1150, 1224-1225, 1238; CX0560 (Feingold, Dep. at 248-249); CX0056 at 005). On the other hand, states have recognized alternatives to a complete ban in the event legitimate concerns exist. For example, some states allow teeth whitening so long as the operator does not put a hand in the customer's mouth. (*See* CX0651 at 003; CX0419 at 001; CX0649 at 001; CX0488 at 049; Nelson, Tr. 668).

The ADA has constructed an exhaustive list of potential notice and disclosure requirements that a state might impose in place of a ban. (CX0488 at 016-018). These include a prominent notice that the provider is not a dentist or other health care professional and that some discoloration may require dental treatment. (CX0488 at 016-018; Kwoka, Tr. 1087). Non-dentist teeth whitening establishments could also be required to obtain certification or permits, but the Board has not advocated for these options. (Kwoka, Tr. 1124-1125; Nelson, Tr. 850).

Finally, the COO of the Board testified at his deposition and again at trial that modifying the cease and desist letter would not prevent the Board from carrying out its statutory responsibilities. (White, Tr. 2240-2241; CX0573 (White, Dep. at 30)). In fact, in the past the

Board has used letters in cases of alleged unlicensed practice of dentistry that do not contain any Order to Cease and Desist. (CX0139 at 001).

M. The Lone Incident Of Purported Harm Was Not Due to Non-Dentist Teeth Whitening

Mr. Brian Runsick alleged that he was injured as a result of his teeth bleaching at the BleachBright facility at Crabtree Valley Mall in February 2008. (Runsick, Tr. 2105-2106). Mr. Runsick reported that he suffered no adverse effects from his teeth bleaching until four or five days after the bleaching, at which time, he said, he developed severe pain, bleeding of the gums, and ultimately sloughing of gingival tissue. (CX0055 at 003; CX0180 at 001). While suffering these symptoms, Mr. Runsick, who was on a cruise when the symptoms began, was examined by a dentist in Mexico. Mr. Runsick's complaint to the Board states that the dentist in Mexico was alarmed at the way the whitening was performed. (CX0055 at 003).

As discussed below and at greater length at CCPFF ¶¶ 1133-1164, Mr. Runsick's claimed injuries could not have been caused by his teeth bleaching. (Giniger, Tr. 274-276, 337; CX0653 at 045-046; CCPFF ¶¶ 1133-1164).

The whitening product used on Mr. Runsick was carbamide peroxide in the 30-35% concentration range, which is equivalent to roughly 10-12% hydrogen peroxide. (Giniger, Tr. 270). Such a product is not sufficiently concentrated to cause a chemical burn as described by Mr. Runsick. Teeth bleaching cannot account for Mr. Runsick's self-reported symptoms. The development of symptoms in response to a chemical burn would occur immediately on or within minutes of exposure, and certainly within no more than a few hours. (Giniger, Tr. 274-275).

The elapse of four days between Mr. Runsick's teeth bleaching and the onset of his self-

reported symptoms is inconsistent with the claim that teeth bleaching caused Mr. Runsick's claimed symptoms. (Giniger, Tr. 274-275, 337, 495-496; CX0653 at 045). The dentist in Mexico wrongly concluded that a Zoom type process was used, with a 35% hydrogen peroxide and intense, heat producing lights. If 35% hydrogen peroxide had been used, Mr. Runsick would have been in immediate, excruciating pain. (CX0560 (Feingold, Dep. at 109-110); CX0567 (Holland, Dep. at 57); CX0572 (Wester, Dep. at 162); Haywood, Tr. 2694-2695). The dentist's failure to understand this basic proposition renders his observations worthless.

Following his complaint to the Board in February 2008, Mr. Runsick was referred to Dr. Tilley for evaluation, not for treatment. Mr. Runsick did not see Dr. Tilley until April 2008, two months after the bleaching procedure. (Tilley, Tr. 2076). Dr. Tilley reported that Mr. Runsick's teeth and gums were in "generally good condition," that there was tartar build-up on Mr. Runsick's mandibular incisors "with no evidence of any recent attempts to remove the tartar," and that the tissue between two of Mr. Runsick's teeth "did not completely fill the inter-dental space (which is the triangular tissue that descends between two teeth)." (CX0327 at 001). Based solely on Mr. Runsick's narrative (for Dr. Tilley did not examine Mr. Runsick when he was symptomatic, nor was he qualified to proffer expert testimony in this matter), Dr. Tilley concluded that his findings and the symptoms described by Mr. Runsick were consistent with a chemical burn from bleaching. (Tilley Tr. 2025, 2087). When asked by the Board's counsel if there were other possible causes, Dr. Tilley testified:

> Q. Would you please give us your observations of Mr. Runsick's condition with respect to bleeding gums.
> A. The day I saw him, he did not have bleeding gums.
> Q. What other causes of gums to bleed are there beyond the application of hydrogen peroxide?
> A. Well, there could be chemical burns and sometimes we can hold an aspirin

> against the cheek and gums and that will cause a chemical burn. There is -- periodontal disease does cause bleeding.
>
> *****
>
> Well, there are just other conditions that can cause the gum tissue to bleed other than hydrogen peroxide.

(Tilley, Tr. 2093-2094). In other words, there were many other potential causes of Mr. Runsick's bleeding.

Dr. Giniger testified that, based on his experience and training in oral diagnoses, Dr. Tilley's findings are not consistent with a chemical burn. (Giniger Tr. 274-275). Like Dr. Tilley, Dr. Giniger attached no clinical significance to the states of Mr. Runsick's mouth and gums. (Giniger, Tr. 273). Dr. Tilley's other findings, including tartar buildup and the interdental space, are consistent with a number of alternative diagnoses, including periodontal disease. (Giniger, Tr. 273-277; CX0653 at 045-046).

Given Dr. Tilley's observations and Mr. Runsick's descriptions, the more likely cause is that Mr. Runsick suffered from a periodontal abscess that occurred within a few days of his teeth bleaching. Indeed, Mr. Runsick may have worsened his condition in his effort to remedy it with constant teeth brushing and other attempted therapies. (Giniger, Tr. 273-275, 492).

Mr. Runsick undoubtedly suffered through a painful experience, but this experience was clearly not caused by a non-dentist teeth whitening procedure. Mr. Runsick's questionable claim, and the lack of similar complaints, shows that anecdotal claims of harm are of little value when assessing the harm from a procedure without generally accepted follow-up procedures. Even more importantly, such anecdotes cannot be a substitute for reliable clinical or empirical evidence about a product's safety and efficacy. (Giniger, Tr. 278-279).

N. The Complaint is Supported By Credible Witnesses And The Defense Is Not

1. Complaint Counsel Witnesses Were Credible

a. Industry Witnesses Are Credible

Mr. Valentine, co-founder of White Smile USA, Mr. Nelson, founder of White Science, and Ms. Osborn, founder of BEKS and President of the Counsel for Cosmetic Teeth Whitening, all were credible witnesses. They described an emerging competitor to dentist teeth whitening. They described an innovative, safe and efficacious service. They described businesses operations that had been not only solvent, but thriving; and sales that have plummeted as a result of the Board's conduct. (CCPFF ¶¶ 665-680).

John Gibson, the Chief Operating Officer of Hull Story Gibson, a real estate management company, was a credible witness. HSG had a successful non-dentist teeth whitening event at a mall in another state (Gibson, Tr. 624-625) and stood ready, willing and able to lease to non-dentist teeth whitening operations. He decided not to because the Board informed his company that non-dentist teeth whitening was unlawful. (CCPFF ¶¶ 331-343).

Brian Wyant and Margie Hughes both operated non-dentist teeth whitening operations that closed as a result of the Board's Order to Cease and Desist. They described a safe, customer administered teeth whitening process. (CCPFF ¶¶ 196-199).

None of this testimony was effectively challenged while they were on the stand, nor rebutted by other witnesses.

b. Complaint Counsel's Expert Witnesses Are Credible

The testimony of Dr. Giniger and Professor Kwoka was informative, credible and

persuasive. Dr. Giniger's credentials are briefly described above and at length at CCPFF ¶¶ 774-799.

Professor Kwoka is the Neal F. Finnegan Distinguished Professor of Economics at Northeastern University. His credentials are discussed at length at CCPFF ¶¶ 1324-1330. Unlike Professor Baumer, Professor Kwoka presented internally consistent and persuasive testimony, without need to apologize or equivocate. The information and opinion evidence provided by Professor Kwoka were well-supported and credible, and should be given great weight.

2. Board Witnesses' Testimony Was Not Relevant On Many Central Issues And Not Credible On Numerous Other Issues

a. Board Fact Witnesses Testimony Was Not Relevant and/or Not Credible

The following fact witnesses testified on behalf of the Board: Drs. Wester, Owens and Hardesty, all Board members, and Bobby White, the Chief Operating Officer. When testifying for the Board, these witnesses answered a litany of yes and no questions propounded by Board Counsel. Much of this testimony related to whether Board members communicate amongst themselves on particular teeth whitening cases. Other parts related to the Board member oaths to uphold North Carolina law. These issues were not relevant.

Much of the testimony related to purported health and safety concerns. As discussed above, these concerns are not credible.

Dr. Owens testimony particularly lacked credibility. His testimony obfuscated and was evasive. He refused to answer the simplest questions. (CCPFF ¶ 1295).

b. Board's Expert Witnesses Did Not Provide Reliable Testimony

With respect to the Board's expert witnesses, neither provided reliable testimony. The problems with Dr. Haywood's testimony were discussed above and at length at CCPFF ¶¶ 800-906.

For the most part, Professor Baumer agrees with Professor Kwoka's analysis. However, there were still many problems with Professor Baumer's testimony, which are discussed above and at greater length in the proposed findings. Professor Baumer essentially relied on two sources of information for all of his assumptions: internet searches and discussions with or pleadings written by Board counsel. Professor Baumer's ad hoc internet searches are not entitled to any weight. And the "facts" Professor Baumer garnered from the Board were almost uniformly wrong or unsubstantiated. Professor Baumer repeatedly admitted that the absence of such "facts" would undermine his opinion in this matter. Additionally, one of the key pieces of Professor Baumer's testimony, that the economic studies cited by Professor Kwoka were not useful, was undercut by Professor Baumer's testimony that he shared Professor Kwoka's views up to and until he was engaged in this matter. Professor Baumer implies that because - in his opinion - it is primarily the young and poor that are in the market for non-dentist teeth whitening that the cross-elasticity impact of the elimination of non-dentist teeth whitening is not as a great a concern. (Baumer, Tr. 1730-1731; CX0826 (Baumer, Dep. at 106)). This view is not supported in law or economics. Finally, Professor Baumer admitted that he did not have adequate time to perform "due diligence" in the preparation of his expert report. (Baumer, Tr. 1834-1835). This rush to finish was reflected in the fact that Professor Baumer had not read important material - *e.g.*, the expert reports of Drs. Haywood or Giniger - and in his report

generally. (RX0078 at 002 n.4 ("I am hoping that there are reforms of the State Board that I can point out"); Baumer, Tr. 1827-1830; CX0826 (Baumer, Dep. at 79-82)). A fuller discussion of problems with Professor Baumer's testimony is found at CCPFF ¶¶ 1333-1335.

ARGUMENT

I. OVERVIEW AND ELEMENTS OF THE VIOLATION

The advent of non-dentist teeth whitening offers consumers a new alternative, combining some of the advantages of dentist service (*e.g.*, quick results) with some of the advantages of OTC whitening strips (*e.g.*, low price). Many consumers find this option to be attractive, as demonstrated by their willingness to patronize non-dentist providers at spa, salon, warehouse club, and mall locations. Whereas consumers are pleased with non-dentist providers, many North Carolina dentists are financially threatened. Dentists face a new form of low-price competition.

Dentist members are elected by other dentists, make up a decisive majority of the Board, and control its decision-making. *State Action Opinion* at 2. The Board has decided that teeth whitening is a service that may be performed only under the supervision of a dentist, and is using the imprimatur of state authority to exclude non-dentists from the marketplace. The methods of exclusion employed by the Board include issuing cease and desist orders to non-dentist providers; issuing cease and desist orders to manufacturers of products and equipment used by non-dentist providers; dissuading mall owners from leasing to non-dentist providers; and enlisting the cosmetology board also to threaten non-dentist providers. All of these steps are undertaken by the Board without review or approval by the state courts, or by any other financially-disinterested state actor.

The manifest purpose and effect of the Board's multi-prong campaign is to eliminate non-dentist teeth whitening operations in North Carolina. The Board's actions have and will substantially reduce the availability of non-dentist teeth whitening, forcing consumers to select

an option that is less appealing to them. In brief, the Board's actions constitute and effectuate an agreement among its dentist-members to exclude from the marketplace a competing product that is desired by consumers. This is anticompetitive.

There is no legitimate efficiency justification for the Board's actions. The Board prefers that consumers turn to their dentists for teeth whitening, and characterizes the non-dentist service as risky, less effective, and/or a bad value. But there is no empirical support for this critique. And in any event the definitive answer is that, as a matter of antitrust law, one group of competitors (here dentists) are not permitted to force their preferences upon the marketplace by excluding their rivals. Antitrust law protects competition and consumer sovereignty – the consumer's right to choose.[10]

This action charges that the Board's conduct constitutes an unfair method of competition in violation of Section 5 of the Federal Trade Commission Act ("FTC Act"). Unfair methods of competition under Section 5 include any conduct that would violate Section 1 of the Sherman Act.[11] In order to prove a violation of Section 1, three elements must be established: (1) the

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[10] *NCAA v. Bd. of Regents*, 468 U.S. 85, 107-08 (1984):

> "Congress designed the Sherman Act as a 'consumer welfare prescription.'" *Reiter v. Sonotone Corp.*, 442 U.S. 330, 343 (1979). A restraint that has the effect of reducing the importance of consumer preference in setting price and output is not consistent with this fundamental goal of anti-trust law. Restrictions on price and output are the paradigmatic examples of restraints of trade that the Sherman Act was intended to prohibit.

See also FTC v. Indiana Fed'n of Dentists, 476 U.S. 447, 459 (1986).

[11] Order Denying Motion to Dismiss, *In re North Carolina Board of Dental Examiners*, No. 9343, at 1 (Mar. 30, 2011) (Chappell, Chief ALJ) (*citing California Dental Ass'n. v. FTC*, 526 U.S. 756, 762 & n. 3 (1999); *FTC v. Cement Inst.*, 333 U.S. 683, 694 (1948); *Fashion Originators' Guild v. FTC*, 312 U.S. 457, 463-64 (1941)).

existence of a contract, combination, or conspiracy among two or more separate entities (*i.e.*, concerted action), that (2) unreasonably restrains competition, and (3) affects interstate or foreign commerce.[12]

II. THE ACTIONS OF THE BOARD CONSTITUTE CONCERTED ACTION

Board decision-making is dominated by six independent dentists, each with a distinct and independent economic interest. Consequently, the conduct of the Board constitutes concerted action within the meaning of the antitrust laws.

Whether the Board is properly characterized as a "single enterprise" or instead as a "contract, combination . . . or conspiracy" requires a "functional consideration of how the parties involved in the alleged anticompetitive conduct actually operate." *American Needle, Inc. v. NFL*, 130 S. Ct. 2201, 2208-10 (2010) (holding that the licensing activities of National Football League constitute concerted action). In this regard, it is undisputed that the dentist-members of the Board operate separate dental practices, and that their economic interests are distinct and potentially competing.[13] Unlike the component parts of a unitary business enterprise (*e.g.*, parent and subsidiary corporations; employer and employee), the dentist-members are not seeking to maximize the profits of the Board – or of any other single economic actor.[14] Further, the Board's efforts to regulate teeth whitening are not the sort of "routine, internal business decisions" of a single firm that are indicative of individual action. *Id.* at 2209. All of these

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[12] ABA Section of Antitrust Law, *Antitrust Law Developments* 2 (6th ed. 2007). *See also Valuepest.com of Charlotte, Inc. v. Bayer Corp.*, 561 F.3d 282, 286 (4th Cir. 2009); *Law v. NCAA*, 134 F.3d 1010, 1016 (10th Cir. 1998).

[13] *American Needle*, 130 S. Ct. at 2206 (NFL teams are "separate, profit-maximizing entities").

[14] *Cf. id.* at 2215 ("We generally treat agreements within a single firm as independent action on

factors, according to *American Needle*, weigh in favor of a finding that the Board is engaged in concerted action.[15]

That the Board is a legal entity does not negate the existence of concerted action. The Supreme Court has "repeatedly found instances in which members of a legally single entity violated Section 1 when the entity was controlled by a group of competitors and served, in essence, as a vehicle for ongoing concerted action." *Id.* at 2205. For example, the Court treats professional organizations[16] and trade groups[17] as concerted actors. These cases are closely analogous to the present litigation, in that the Board (like these non-governmental entities) is a mechanism for competing professionals to engage in industry self-regulation[18] – a core Section 1 concern. Even more precisely on point is *In re Massachusetts Board of Registration in Optometry*, 110 F.T.C. 549, 610-11 (1988), holding that a state agency consisting of independent competitors is engaged in concerted action.

Because the Board's conduct constitutes concerted action, the claim that there has been no conspiracy between the Board and non-Board dentists is irrelevant. One conspiracy is

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the presumption that the components of the firm will act to maximize the firm's profits.").

[15] The dentists have a common interest in excluding competition from non-dentists. This, however, is not probative of a single enterprise. *Id.* at 2213 ("[I]llegal restraints often are in the common interests of the parties to the restraint, at the expense of those who are not parties.").

[16] *FTC v. Indiana Fed'n of Dentists*, 476 U.S. 447 (1986); *Arizona v. Maricopa County Med. Soc.*, 457 U.S. 332 (1982); *Nat'l Soc. of Prof'l Eng'rs v. United States*, 435 U.S. 679 (1978).

[17] *Allied Tube & Conduit Corp. v. Indian Head, Inc.*, 486 U.S. 492 (1988); *Radiant Burners, Inc. v. Peoples Gas Light & Coke Co.*, 364 U.S. 656 (1961) (per curiam); *Fashion Originators' Guild of America, Inc. v. FTC*, 312 U.S. 457 (1941).

[18] *See State Action Opinion* at 13 (the Board is "a state regulatory body that is controlled by participants in the very industry it purports to regulate").

conspiracy enough. Also legally (and economically) irrelevant is the Board's claim that the challenged conduct has occurred in public. Public, overt conspiracies are actionable under the antitrust laws. *E.g., FTC v. Superior Court Trial Lawyer's Ass'n*, 493 U.S. 411, 414, 416 (1990) (condemning price-fixing agreement that was "well-publicized" by the conspirators); *San Juan Racing Ass'n v. Asociacion de Jinetes, Inc.*, 590 F.2d 31, 32 (1st Cir. 1979) ("Their openness does not immunize agreement.").[19]

The concerted action requirement is therefore satisfied.

III. THE BOARD'S CONCERTED ACTIONS EXCLUDE NON-DENTIST PROVIDERS OF TEETH WHITENING SERVICES, AND ARE PRIMA FACIE ANTICOMPETITIVE UNDER EACH OF THREE VARIATIONS OF THE RULE OF REASON

The next issue is whether the concerted actions of the Board – including the issuance of cease and desist letters to non-dentist operators and manufacturers, and warning letters to mall owners – unreasonably restrain competition.

The Commission's framework for competitive effects analysis under the rule of reason is set forth in *Realcomp*.[20] The aim of this analysis is to reach "a confident conclusion about the principal tendency of a restriction." *California Dental Ass'n v. FTC*, 526 U.S. 756, 781 (1990). That is, are the challenged restraints likely to enhance competition, or instead, are they likely to result in higher prices, reduced output, degraded quality, retarded innovation, or some other

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[19] The Complaint alleges that the dentist-members of the Board have "colluded." In this context, collusion refers to any type of improper or suspect agreement. *See, e.g., Verizon Commc'n, Inc. v. Law Offices of Curtis V. Trinko*, 540 U.S. 398, 408 (2004); *Indiana Fed'n of Dentists*, 476 U.S. at 465. *Accord* Kenneth L. Glazer, *Concerted Refusals to Deal Under Section 1 of the Sherman Act*, 70 Antitrust L.J. 1, 4 (2002).

[20] *In re Realcomp II, Ltd.*, No. 9320, 2009 F.T.C. LEXIS 250 (FTC Oct. 30, 2009), *aff'd, Realcomp II, Ltd. v. FTC*, No. 09-4596, 2011 U.S. App. LEXIS 6878 (6th Cir. Apr. 6, 2011).

manifestation of harm to consumer welfare? *Realcomp*, 2009 F.T.C. LEXIS 250, at *51-52. The antitrust laws reach conduct where competitive injury has already been realized, or where competitive injury is likely to arise. *United States v. Microsoft*, 253 F.3d 34, 78-80 (D.C. Cir. 2001) (conduct directed at "nascent threats" actionable under Sherman Act); *FTC v. Brown Shoe Co.*, 384 U.S. 316, 322 (1966) (Section 5 empowers the Commission to enjoin in their incipiency restraints which, if allowed to continue, would substantially harm competition); *FTC v. Motion Picture Adver. Servs. Co.*, 344 U.S. 392, 394-95 (1953) (same).

The first step in every rule of reason analysis is to evaluate whether the evidence establishes a prima facie case of competitive harm. Drawing on Supreme Court case law, *Realcomp* identifies three distinct "modes of analysis," meaning three independently sufficient methods, available to establish that the challenged conduct has the potential for genuine adverse effects on competition. A prima facie case of competitive harm may be based upon: (i) a finding that the challenged restraint, by its nature, is inherently suspect, (ii) the anticompetitive nature of the challenged restraint together with evidence of market power, or (iii) direct evidence of actual competitive harm. As detailed below, each and all of these evaluations conclusively establish that the Board's ongoing campaign of excluding non-dentists from providing teeth whitening services is prima facie anticompetitive. In order to escape liability, then, the Board will be required to advance a legitimate efficiency justification. *Realcomp*, 2009 F.T.C. LEXIS 250, at *41-52, *74.

A. The Board's Campaign to Exclude Non-Dentist Teeth Whitening is Inherently Suspect, and This Is Sufficient to Establish a Prima Facie Case of Competitive Harm

Concerted action calculated to exclude from the marketplace a competing product has, by

its logic and nature, an obvious tendency to injure competition and consumers. This conclusion is supported by basic economic theory, past judicial experience, and an extensive economic literature. It follows that the Board's campaign to exclude non-dentist teeth whitening is inherently suspect, and requires an efficiency justification.[21]

First, to determine whether a restraint is inherently suspect, the Commission considers whether basic, accepted economic theory teaches that the "restrictions are of a sort that generally pose significant competitive hazards." *PolyGram*, 136 F.T.C. at 345. This description aptly captures the actions of the Board at issue here; that is, "an observer with even a rudimentary understanding of economics" could readily conclude that the exclusion of a rival product "would have an anticompetitive effect on customers and markets." *California Dental*, 468 U.S. at 769-70. Complaint Counsel's economic expert, Dr. Kwoka, explained the uncontroversial economic insight underlying this conclusion:

> There is a product variant that some consumers prefer. That's clear because they purchase it in the market. That product variant, if excluded from the market, makes those consumers and perhaps others worse off. (Kwoka, Tr. 1004-1005).

More specifically, in response to the exclusion of non-dentist services, consumers are forced to shift to dentist services or to OTC products, or they may forgo teeth whitening entirely. All such consumers are denied their first and best alternative, and necessarily experience a loss of

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[21] *Realcomp*, 2009 F.T.C. LEXIS 250, at *53-56 (where the likelihood of anticompetitive effects is intuitively obvious, the proponent of the restraint must provide some pro-competitive justification). *See also California Dental Ass'n*, 526 U.S. at 769-71 (where the conduct at issue is inherently suspect owing to its likely tendency to suppress competition, scrutiny of the restraint itself is sufficient to establish antitrust plaintiff's prima facie case); *North Texas Specialty Physicians v. FTC*, 528 F.3d 346, 362-63 (5th Cir. 2008) (physicians group's collective negotiation of fees is inherently suspect); *In re Polygram Holding, Inc.*, 136 F.T.C. 310, 353-58 (2003) (music companies' agreements to forgo discounting and advertising are inherently suspect).

consumer welfare, which is a measure of consumer harm. (Kwoka, Tr. 1008-1009, 1011-1013). Exclusion of a product desired by consumers is therefore presumed in economics to be anticompetitive, absent some compelling justification. (CX0654 at 009-010).

Respondent's economic expert, Dr. Baumer, agreed with this conclusion, characterizing the exclusion analysis set forth above as "Economics 101." (Baumer, Tr. 1726-1727, 1763; *see also* CX0826 (Baumer, Dep. at 122-123 ("Yes, there's no doubt that, you know, if you reduce products, other things being equal, that there's a loss in consumer welfare or consumer surplus.")); CX0826 (Baumer Dep. at 171 ("[Y]es exclusions will result in competitive consequences and one of which is a price increase, I mean, I don't disagree with him [Dr. Kwoka].")). The proposition that concerted product exclusion is fundamentally and obviously anticompetitive is also endorsed by leading antitrust scholars. *E.g.*, Herbert Hovenkamp, *Exclusive Joint Ventures and Antitrust Policy*, 1995 Colum. Bus. L. Rev. 1, 66 (1995) (Product exclusion "is anticompetitive when its purpose or effect is to keep a product or process off the market that consumers would prefer, or that is cheaper to produce, but whose introduction would threaten the profits of firms making rival products.").

Second, to determine whether a restraint is inherently suspect, the Commission evaluates whether the challenged conduct bears a "'close family resemblance' to conduct that courts previously have treated with acute suspicion," or have condemned as unlawful per se (that is, condemned without an assessment of defendants' market power and without direct proof of consumer harm). *Realcomp*, 2009 F.T.C. LEXIS 250, at *64-65. The Supreme Court case law addressing conspiracies to exclude a rival product is extensive. The modes and methods of exclusion vary in these cases. What is constant is that concerted action by competitors to

exclude a rival product from the marketplace is treated as presumptively or per se anticompetitive. We discuss the Supreme Court cases in chronological order.

The seminal case addressing concerted exclusion is *Fashion Originators' Guild v. FTC*, 312 U.S. 457 (1941). The Guild was an association of companies that manufactured original and fashionable clothing for women. Members of the Guild were unhappy about competition from "style pirates"– firms that sold low-priced copies of original designs. In order to eliminate these competitors, Guild members agreed to decline to sell their products to retailers that carried garments based on copied designs. The Court recognized that the Guild's plan had the "necessary tendency" of suppressing competition from the sale of copied designs. *Id.* at 465. On this basis, and notwithstanding the claim that style piracy violated state law, the agreement to exclude competing products was judged to be per se illegal.

Another similar case is *Radiant Burners, Inc. v. Peoples Gas Light & Coke Co.*, 364 U.S. 656 (1961). The American Gas Association ("AGA") was a trade association whose members included public utilities, pipeline companies, and manufacturers of gas burners for heating buildings. AGA offered a "seal of approval" to gas burners that passed association tests purporting to evaluate safety, utility and durability; members refused to sell gas for use in gas burners that were not approved by the association. Plaintiff Radiant Burners submitted its ceramic gas burner for review by AGA, but it was not approved. The AGA's determination was arbitrary, and influenced by competitors of Radiant Burners. As would-be consumers of Radiant Burners products were unable to buy gas for use in those burners, the company was "effectively excluded from the market." *Id.* at 658. The Court concluded that this concerted refusal to provide Radiant Burners with the necessary certification "clearly has, by its 'nature' and

'character,' a 'monopolistic tendency,'" and hence was per se unlawful. *Id.* at 660.

The next case in this line involves the dental profession. *FTC v. Indiana Fed'n of Dentists*, 476 U.S. 447 (1986). Insurance companies review patient x-rays supplied by dentists in order to avoid making payment for unneeded or inappropriate services. A group of dentists agreed to withhold x-rays from dental insurance companies. The Court categorized the restraint as "a horizontal agreement among the participating dentists to withhold from their customers a particular service that they desire." *Id.* at 459. As such, the "anticompetitive character" of the agreement was clear on its face. *Id.* The Court held that an agreement among competitors to eliminate a desired service, by its very nature, requires justification even in the absence of a showing of market power. *Id* at 460.

The most recent Supreme Court cases involving concerted exclusion arise in the context of standard-setting activity, starting with *Allied Tube & Conduit Corp. v. Indian Head*, 486 U.S. 492 (1988). Many manufacturers of building materials, including makers of steel conduit, were members of the National Fire Protection Association ("NFPA"), an organization that developed and updated a model code for electrical wiring systems. The NFPA code was highly influential; many state and local governments routinely adopted the code into law with little or no change. Plaintiff Indian Head developed an alternative to steel conduit made of polyvinyl chloride. This plastic conduit was cheaper to make and easier to install. When Indian Head attempted to have the plastic conduit approved in the NFPA's model code, the defendant makers of steel conduit "packed" the NFPA meeting with their own agents and employees. The now hijacked association voted to disapprove Indian Head's new product. "There is no doubt," the Court recognized, that industry standard setting has "a serious potential for anticompetitive harm." *Id.*

at 500. Among other problems, "'it might deprive some consumers of a desired product.'" *Id.* at 501 n.5 (*quoting* 7 P. Areeda, Antitrust Law ¶ 1503, p. 373 (1986)). *See also Am. Soc'y of Mechanical Eng'rs v. Hydrolevel*, 456 U.S. 556, 559, 577-78 (1982) (affirming liability against an influential standard setting organization where an agent of the organization improperly represented that a new product did not comply with the industry code, thereby placing the new product "at a great disadvantage in the marketplace").

It is instructive to contrast these Supreme Court cases involving concerted exclusion of a rival product from the marketplace with a case involving simple exclusion of the rival from a non-essential joint venture. *See Nw. Wholesale Stationers, Inc. v. Pac. Wholesale Stationers, Inc.*, 472 U.S. 284 (1985). Northwest was a cooperative made up of approximately one hundred office supply retailers, and provided purchasing and warehousing services for its members. The members of Northwest voted to expel from the cooperative long-time member Pacific Stationery. Pacific Stationery sued the cooperative, alleging that it was the victim of a per se unlawful group boycott. The Court offered this synthesis of earlier cases and the applicability of per se analysis:

> Cases to which this Court has applied the *per se* approach have generally involved joint efforts by a firm or firms to disadvantage competitors by "either directly denying or persuading or coercing suppliers or customers to deny relationships the competitors need in the competitive struggle." In these cases, the boycott often cut off access to a supply, facility, or market necessary to enable the boycotted firm to compete, and frequently the boycotting firms possessed a dominant position in the relevant market.

Id. at 294 (citations omitted). Northwest did not control access to an asset or facility needed by Pacific Stationery in order to compete effectively in the marketplace. As exclusion from the wholesale cooperative did not place Pacific Stationery at a severe competitive disadvantage, the Court declined to apply the per se rule.

The present case involves not exclusion of a single competitor from an non-essential joint venture (*cf. Nw. Wholesale Stationers*), but rather the wholesale exclusion from the marketplace of a distinct category of providers – conduct similar to or more plainly anticompetitive than the restraints at issue in *Fashion Originators' Guild, Radiant Burners, Allied Tube, Indiana Fed'n of Dentists*, and *Hydrolevel*. These Supreme Court precedents amply support the conclusion that the Board's exclusion of non-dentists is presumptively anticompetitive.

Third, in determining whether a challenged restraint is inherently suspect, the Commission considers whether there are relevant economic studies demonstrating a reason for close antitrust scrutiny. *PolyGram*, 136 F.T.C. at 344-45. In this regard, Dr. Kwoka described an extensive body of empirical work by economists looking at restrictions adopted on entry to, or competition with, various professions, and the effect of such restrictions on price and quality. These restrictions were adopted by state legislatures or state agencies, and have often been shown to be anticompetitive.[22]

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[22] The studies relied on by Dr. Kwoka are submitted as Appendix A to Complaint Counsel's Findings of Fact, Conclusions of Law, Memorandum of Law in Support Thereof and Order. *See* Bryan Boulier, *An Empirical Examination of the Influence of Lisensure and Licensure Reform on the Geographic Distribution of Dentists*," *in* Occupational Licensure and Regulation (S. Rottenberg ed., 1980) (restrictions on the interstate mobility of dentists were associated with higher dentists' fees and net income); Simon Rottenberg, *Introduction, in* Occupational Licensure and Regulation (S. Rottenberg ed., 1980) (stricter licensing standard are associated with higher prices and a reduction in the provision of professional services); Shirley Svorny, *Licensing, Market Entry Regulations, in* III Encyclopedia of Law & Economics, The Regulation of Contracts 296 (Boudewijn Bouckaert & Gerrit De Geest ed., 2000) (economists have long favored certification over licensure); Ronald Bond, John Kwoka, John Phelan, & Ira Whitten, *Self-Regulation in Optometry: The Impact on Price and Quality*, 7 Law & Human Behavior 219 (1983) (empirical study concluding that the primary effect of commercial restrictions for professional optometry services is to raise the prices consumers must pay for these services); Ronald Bond, John Kwoka, John Phelan, & Ira Whitten, *Effects of Restrictions on Advertising and Commercial Practice in the Professions: The Case of Optometry* (Bureau of Economics Staff Report, FTC 1980) (same); L. Jackson Brown, Donald House & Kent Nash, *The Economic*

By way of background, states vary significantly in the kinds of regulations that they impose on licensed service providers, including doctors, dentists, optometrists, veterinarians, real estate brokers, plumbers, and electricians.

- States vary in terms of the availability of reciprocity – whether a state will accept, for purposes of admission to practice in the state, that an applicant is duly licensed in another state. (Kwoka, Tr. 1037; CX0654 at 015-016).

- States vary in terms of the rigor of licensing exams, with some states imposing high failure rates to stem the admission of new practitioners. (Kwoka, Tr. 1037-1038; CX0654 at 013, 016).

- States impose varying restrictions on the licensee's form of practice, including restrictions on the number of para-professionals that may be hired. (Kwoka, Tr.

Aspects of Unsupervised Private Hygiene Practice and its Impact on Access to Care, ADA Health Policy Resources Center (2005) (the provision of services by "unsupervised" dental hygienists did not adversely impact the cost or quality of dental hygiene services); Sydney Carroll & Robert Gaston, *Occupational Restrictions and the Quality of Service Received*, 47 Southern Econ. J. 959 (1981) (licensing restrictions reduce the number of dentists and may adversely affect care); Douglas Conrad & Marie Emerson, *State Dental Practice Acts: Implications for Competition*, 5 J. Health Politics, Policy & Law 613 (1981) (empirical results suggest that the absence of reciprocal licensing arrangements and restraints on the use of dental hygienists are associated with higher dental fees); Arthur DeVany & Wendy Gramm, *The Impact of Input Regulation: The Case of the U.S. Dental Industry*, 25 J.L. & Econ. 367 (1982) (excessive state restrictions cause dental hygienists to be underutilized, which in turns results in increased prices for consumers); Morris Kleiner, *Occupational Licensing,* 14 J. Econ. Perspectives 189 (2000) (an empirical analysis of the impact of varying state licensing requirements showing that tougher licensing standards do not improve outcomes, but do raise prices for consumers and the earnings of practitioners); Morris Kleiner & Robert Kudrle, *Does Regulation Affect Economic Outcomes? The Case of Dentistry*, 43 J.L. & Econ. 547 (2000) (more stringent licensing standards led to fewer dentists per capita and greater untreated dental deterioration); Morris Kleiner and Robert Kudrle, *Does Regulation Improve Outputs and Increase Prices? The Case of Dentistry* (NBER Working Paper 5869, 1997); J. Nellie Liang & Jonathan Ogur, *Restrictions on Dental Auxiliaries* (Bureau of Economics Staff Report, FTC 1987) (states that restricted the role of dental hygienists had higher fees and/or higher net income for dentists); Lawrence Shepard, *Licensing Restrictions and the Cost of Dental Care*, 21 J.L. & Econ. 187 (1978) (states without licensing reciprocity for dentists had significantly higher fees); Deborah Haas-Wilson, *The Effect of Commercial Practice Restrictions: The Case of Optometry*, 29 J.L. & Econ. 165 (1986) (consumers paid at least $4.7 million more for eye examinations and eyeglasses in 1977 as a result of four commercial practice restrictions).

1038; CX0654 at 013-014, 016-017).

These restrictions on competition are often adopted at the behest of the incumbent providers, and defended by them as necessary to protect consumers from the dangers posed by unqualified practitioners. (Similar to the Board's restraints on non-dentist teeth whitening.) It turns out, however, that these restrictions are generally unnecessary and harmful to consumers. (Kwoka, Tr. 1041).

One study examined the effect of state laws restricting the ability of dental hygienists to perform services that would otherwise be performed by dentists. The number of hygienists that a dentist may employ varies by state. In states that limited the number of hygienists that may be hired, the average price of a dental visit was 5% higher than the mean of all states. States also have varying restrictions on the functions that may be performed by hygienists. In states that do not permit hygienists to complete amalgam restorations, the average price for this service was 6 percent higher than the mean.[23] In brief, then, expanding the domain of services that are reserved to dentists alone resulted in higher prices for consumers. (Kwoka, Tr. 1043-1044).

Dr. Kwoka summarized the literature on states' restrictions in the professions this way:

> There are a large number of studies I should say to begin with, and summarizing them turns out not to be that difficult despite their large number. Time after time these studies find that restrictions on reciprocity, restrictions through the use of high fail rates on exams, restrictions on scope of practice have the effect of increasing the price of services within the states with the most stringent of such regulations. But time after time the studies do not find any systematic benefits in quality to consumers. (Kwoka, Tr. 1041).

The Board's economics expert, Dr. Baumer, did not dispute these findings, stating: "It is true

[23] Both of the cited results involve data from 1970. J. Nellie Liang & Jonathan Ogur, *Restrictions on Dental Auxiliaries* (Bureau of Economics Staff Report, FTC 1987)

that state regulatory boards can be used to exclude competition and augment incomes of licensed practitioners."[24] (RX0078 at 008).

The professional restraints that have been studied by economists – and that have been shown to be anticompetitive – tend to be less restrictive than the exclusion of an entire category of competing providers (which is the conduct at issue here). Even so, the empirical literature is consistent with the prediction of basic economic theory, and supports the Supreme Court precedent discussed above: Product exclusion has a clear tendency to injure consumers through higher prices and reduced consumer choice. Accordingly, the Board's exclusion of non-dentist providers of teeth whitening services should be judged to be inherently suspect.[25]

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[24] Dr. Baumer opined that many of the economic studies relied upon by Dr. Kwoka are "old" or "outdated." (Baumer, Tr. 1765-1766). Dr. Kwoka explained why this is a feeble criticism:

> I think [Dr. Baumer's contention is] factually incorrect in part. At least three of the studies that I cite date from the year 2000 or more recent, and so certainly not all of the literature is whatever "outdated" may mean. That's fairly current in scholarly literature.
>
> But it is true that there was a surge of interest in these topics 25 years or so ago, and there was a corresponding surge of published reports at that time . . . . But what of course happened is that study after study found similar results, found higher prices without benefits in terms of quality, and once that was established, graduate students and Ph.D. economists and faculty and researchers everywhere stopped running test after test only to find the very same thing.
>
> And in fact there have been no contrary studies in recent years looking to challenge that now conventional and consensus view among economists . . . .
>
> [T]here's nothing outdated about the results, and much of the literature is not in any sense outdated either. (Kwoka, Tr. 1054-1055).

[25] In addition to their significance in the inherently suspect analysis, these economic studies make it clear that "healthy skepticism" (Baumer, Tr. 1916-1917) should be applied to asserted health and safety claims of a self-regulatory body such as the Board, rather than the "presumption of good faith" urged by the Board. (*See also* Kwoka, Tr. 1112-1113 (studies

Upon being judged as inherently suspect, the Board's restraints will be ruled to violate Section 5, unless the Board can overcome this presumption of competitive injury by showing that the practice is necessary to promote a cognizable efficiency. As we explain below, the Board's proffered justifications are both non-cognizable and unsupported by the evidence.

B. The Board's Market Power Together With the Tendency Of Its Practices To Harm Competition Also Establish A Prima Facie Case Of Competitive Harm

Even if the Board's exclusionary conduct is not sufficiently egregious as to warrant application of the inherently suspect framework, the restraints should still be deemed prima facie anticompetitive when viewed in conjunction with the Board's substantial market power. This is the "traditional" mode of rule of reason analysis.[26] Start with conduct that by its nature has a tendency to harm competition, show that the defendant also has the power or capability to harm competition, and the court should then infer that the arrangement under review has the potential for genuine adverse effects.[27] The anticompetitive nature of the Board's campaign to exclude non-dentists from the marketplace is discussed in Part IIA, above. Here we show that the Board also has the power to harm competition.

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indisputably show that simply because board members are sworn state officials or ethical in their own conduct does not contravene the fact that their practices have been unduly restrictive and harmful to consumers)).

[26] *Realcomp*, 2009 F.T.C. LEXIS 250, at *46.

[27] *Realcomp*, 2009 F.T.C. LEXIS 250 at *95-96 ("Complaint counsel argues that the finding of market power, coupled with a determination that the nature of the challenged policies was to suppress competition, support an inference of actual or likely adverse effects. We agree, and both case law and commentary support that proposition. The ALJ's contrary conclusion constitutes an error of law.") (citations omitted), *aff'd, Realcomp II, Ltd. v. FTC*, 2011 U.S. App. LEXIS 6878 at *25 ("Market power and the anticompetitive nature of the restraint are sufficient to show the potential for anticompetitive effects under a rule-of-reason analysis, and once this showing has been made, Realcomp must offer procompetitive justifications.").

It is important to be clear about the type of market power that is relevant to the present litigation, in light of the theory of competitive harm. Market power is defined as the ability to raise prices or the ability to exclude competition. *E.I. du Pont de Nemours & Co.*, 351 U.S. 377, 391 (1956). In an exclusion case such as this, the most relevant market power question is whether the respondent has the ability to exclude – or more specifically, "the ability to foreclose from the market or to limit a rival's output or expansion."[28] Market power of this type may derive, for example, from control over some unique or essential asset or facility. The explanation is that exclusive access to an essential asset or facility confers upon defendants the power to withhold access, thus to exclude rivals from the marketplace, and in this way to harm competition. *E.g., Nw. Wholesale Stationers*, 472 U.S. at 296 (a group boycott that excludes a rival from "an element essential to effective competition" is prima facie anticompetitive); *Associated Press v. United States,* 326 U.S. 1, 18-19 (1945) (newspapers' exclusion of rival from an important source of news is prima facie anticompetitive); *Silver v. N.Y. Stock Exchange*, 373 U.S. 341, 347-49 (1963) (NYSE's exclusion of dealer from communications network "needed in order to compete effectively" in the securities market is prima facie anticompetitive); *Weiss v. York Hospital*, 745 F.2d 786, 818 (3d Cir. 1984) (physicians' exclusion of osteopath from dominant hospital is prima facie anticompetitive); *United States v. Realty Multi-List, Inc.*, 629 F.2d 1351, 1370-71, 1374-75 (5th Cir. 1980) (real estate brokers' exclusion of rivals from multiple listing service is prima facie anticompetitive); *Virginia Acad. of Clinical Psychologists v. Blue Shield of Virginia*, 624 F.2d 476, 485-86 (4th Cir. 1980) (physicians' exclusion of

[28] Hovenkamp, *Exclusive Joint Ventures, supra*, at 67.

clinical psychologists from necessary medical plan is prima facie anticompetitive).[29]

Also instructive concerning the power to exclude are the standard-setting cases *Allied Tube* and *Hydrolevel.* In each case, the defendant standard-setting organization ("SSO") had the power to exclude because the SSO's decision to disapprove a product strongly influenced the government, and the government in turn regulated access to the market.[30] In the present case, the market power analysis is more direct. The Board does not merely influence government; it is itself a state actor. By virtue of its status and authority as a state agency, the Board has the power of life and death over would-be competitors (even when the Board is acting outside of its proper authority under state law).[31] The Board can withhold from an applicant a license to practice dentistry in the state of North Carolina. Under its cloak of authority, the Board can issue a cease and desist order to a person that, without a license, proceeds to practice "dentistry" (as defined unilaterally by the Board). The Board can induce a mall owner to withhold from a

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[29] *See generally* Hovenkamp, *Exclusive Joint Ventures, supra,* at 65-70, 82-89 (analyzing product exclusion in the context of a joint venture, and explaining that the market power requirement is satisfied where the venture has access to some unique or essential input enabling the venture to keep a rival product off the market).

[30] *See Allied Tube,* 486 U.S. at 495-96; *Hydrolevel*, 456 U.S. at 570-71 (citations omitted):

> ASME wields great power in the Nation's economy. Its codes and standards influence the policies of numerous States and cities, and . . . its interpretations of its guidelines "may result in economic prosperity or economic failure, for a number of businesses of all sizes throughout the country," as well as entire segments of an industry. ASME can be said to be "in reality an extra-governmental agency, which prescribes rules for the regulation and restraint of interstate commerce.". . . . [ASME's agents have] the power to frustrate competition in the marketplace.

[31] In Part III.C.2., *infra,* we explain that the fact that the Board has acted in an anticompetitive manner but without appropriate statutory authority does not obviate or diminish the Board's antitrust liability.

potential entrant a commercial lease (a necessary input for teeth whitening).[32] And the Board can cause out-of-state providers of teeth whitening equipment and supplies to stop soliciting or serving non-dentist providers in North Carolina. In sum, acting with the imprimatur of the State and wielding these (often illegitimate) powers, the Board can and has forced non-dentist teeth whitening operators to terminate their businesses, and deterred others from entering. Similar evidence in the *Mass. Board* case supported a finding that the respondent, also a state agency, possessed market power.[33]

The Board agrees that it has the power to exclude, and acknowledges that it has used that power to drive from the marketplace non-dentist teeth whitening businesses that (in the Board's view) operate illegally. This concession is evidenced most clearly in the testimony of the Board's economist. (CX0826 at 036 (Baumer, Dep. at 136-137 (There is potential for abuse because the Board has "the power to exclude competition . . . . It's because they have the power to exclude consistent with kind of exclusion model of [described by] Kwoka and myself."))).

The proposition that government regulation can exclude competition is also well established in the antitrust case law. *See FTC v. University Health, Inc.*, 938 F.2d 1206, 1219 (11th Cir. 1991) ("[T]he FTC demonstrated that Georgia's certificate of need law – which regulates the addition of hospital services based on the need of the public – is a substantial

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[32] *See Toys "R" Us v. FTC*, 221 F.3d 928, 936 (7th Cir. 2000) ("TRU was trying to disadvantage the warehouse clubs, its competitors, by coercing suppliers to deny the clubs the products they needed.").

[33] 110 F.T.C. at 588 ("[The Massachusetts Board of Registration in Optometry] has market power. The Board's disciplinary powers give it the ability to impose sanctions on any optometrist who fails to obey its rules and regulations. The Board can impose its restraints on the market for optometric goods and services throughout Massachusetts.").

barrier to entry by new competitors and to expansion by existing ones."); *United States v. Syufy Enterprises*, 903 F.2d 659, 673 (9th Cir. 1990) ("It is well known that some of the most insuperable barriers in the great race of competition are the result of government regulation."); Philip E. Areeda & Herbert Hovenkamp, *Antitrust Law* ¶ 421(h), at 88-91 (3d ed. 2007) (government constraints may raise costs of entry or block entry completely).

The conduct of the Board should therefore be judged prima facie anticompetitive under traditional rule of reason analysis. The challenged restraints have an obvious tendency to exclude rivals, and the Board has sufficient market power to precipitate this harm. Therefore, the Board's exclusionary conduct requires justification – and we will see that no justification has been established.

C. The Record Contains Substantial Direct Evidence Of The Adverse Competitive Effects Flowing From The Board's Conduct

Drawing on the Supreme Court's analysis in *IFD*, the *Realcomp* decision recognizes a third variant of the rule of reason. Complaint Counsel may show a presumptive violation of Section 5 by providing direct proof that the challenged restraints have resulted in, or are likely to result in, anticompetitive effects. *Realcomp*, 2009 F.T.C. LEXIS 250 at *45-46.

1. Anticompetitive Effects

The trial record includes direct evidence that the Board's actions have resulted in the forced exit of existing non-dentist competitors, and the deterred entry of potential competitors. This is sufficient to establish a prima facie case. *See IFD*, 476 U.S. at 460-61; *Realcomp*, 2009 F.T.C. LEXIS 250 at *26-27, *92-93.

IFD concerned a group of dentists who agreed to withhold patient x-rays from dental

insurance companies. The Court accepted as sufficient direct proof of adverse effects evidence that in two localities, over a period of years, insurers were "actually unable to obtain compliance with their requests for submissions of x-rays." 476 U.S. at 460. This evidence showed that the dentists' conduct caused an unacceptable "disrupt[ion]" to the proper functioning of a free market. *Id.* at 461-62.

In *Realcomp*, the Commission condemned the policies of a group of competing real estate brokers that in various ways restrained the dissemination of information to consumers regarding discount, limited-service real estate listings. Detrimental effects in this case were evidenced by a decline in the percentage of limited-service listings appearing on the local multiple-listing service after the implementation of the challenged policies. This decline indicated that providers of the low-price product were "losing their toehold in the market." *Realcomp*, 2009 F.T.C. LEXIS 250 at *119-126.[34]

As in *IFD* and *Realcomp*, here too there is direct evidence of consumer harm. Non-dentist providers of teeth whitening services have been excluded from the marketplace as a result of the Board's policies. During the period from 2006 to 2009, the Board sent cease and desist orders to over 40 spa, salon, and kiosk operators, ordering the recipients to stop providing teeth whitening services in North Carolina. The recipients commonly acceded to the Board's demand and exited the market. In addition, numerous potential operators never entered. For example, one company asked if a series of teeth whitening venues he planned to open could use dental hygienists. The Board took the position that supervision was necessary. Other firms were

[34] As the Commission explained, given this evidence of an impact on the mix of available services, Complaint Counsel was not required also to proffer "elaborate econometric 'proof that the restraint resulted in higher prices.'" *Realcomp*, 2009 F.T.C. LEXIS 250 at 45-47.

similarly dissuaded. The Board also sent letters to mall operators informing them that non-dentist teeth whitening was unlawful and asking that they refrain from entering into leases with non-dentist teeth whitening businesses. The evidence indicates, again, that mall operators acceded to the Board's request. This resulted in lease termination and non-renewal, as well as the malls turning down additional interested parties. Distributors of teeth whitening products testified that, due to the Board's actions, they were unable to recruit operators in North Carolina – and thus stopped trying to do so.

It is no defense to claim that some non-dentist teeth whitening operations remain in the marketplace notwithstanding the substantial exclusion recited above. Complete exclusion is not the standard for establishing liability. *Realcomp* is again on point. Discount listings were not completely excluded from the marketplace, but their prevalence declined as a result of competitors' actions. *Id.* at *108-112. Liability was established because the market would have been "*more* effectively competitive" in the absence of the challenged practices. *Id.* at *110 & n.42 (emphasis in original). More specifically, there is liability under the rule of reason when the respondent's practices "operate to narrow consumer choice or hinder the competitive process." *Id.* at *111.[35] Moreover, consumer harm will surely grow, unless this lawsuit results in an appropriate order. Section 5 empowers the Commission to enjoin in their incipiency restraints which, if allowed to continue, will substantially harm competition. *E.g., Brown Shoe*, 384 U.S. at 322.

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[35] *Accord United States v. Dentsply Int'l Inc.*, 399 F.3d 181, 191 (3d Cir. 2005) ("[I]t is not necessary that all competition be removed from the market. The test is not total foreclosure, but whether the challenged practices bar a substantial number of rivals or severely restrict the market's ambit.").

2. Causation

The Board denies that its actions are the legal cause of the decline of non-dentist teeth whitening operations in North Carolina. The Board seeks to shift culpability to the non-dentist operators who complied with the Board's orders to cease and desist. The Board's arguments are factually and legally incorrect.

First, the Board asserts that its letters to non-dentist operators only warn of the possibility of litigation, and do not in fact order the recipient to cease and desist from providing teeth whitening services. This is simply untrue. The letters begin with a bold caption: "ORDER TO CEASE AND DESIST." The body of the letters unambiguously directs the recipient to cease its activities. The letters are sent by and on behalf of a state agency, and so carry the imprimatur of the state. Representatives of the Board intended that the letters be understood as an order. Recipients in fact understood the letters as an order from a governmental agency. In sum, and as the Commission has previously determined: "The undisputed facts show that the Board on numerous occasions sent letters to non-dentist providers . . . ordering the recipients to cease and desist from providing teeth-whitening services in North Carolina." *State Action Opinion* at 5. That the letters may also warn of possible litigation changes nothing; the documents unmistakably order the recipients to cease and desist.

The Board's second contention is that, to the extent that the Board letters order non-dentist operators to cease and desist, the letters are legally void and may be ignored by the recipients. Therefore, according to the Board, it is not legally responsible for a decision by any non-dentist to exit the market. Board member testimony that the Board does not actually have the legal authority to issue or to enforce a cease and desist order is of course correct. But the

Board's conclusion that this lack of authority somehow excuses its exclusionary tactics turns antitrust law on its head. Under the state action doctrine, a financially-interested regulatory board is exempt from antitrust liability when its actions are authorized and supervised by the State. *State Action Opinion* at 13. The absence of proper authority is not a defense, but rather a window to liability.

For purposes of assessing competitive harm, the undeniable and dispositive fact is that the Board's orders caused competitors to exit the marketplace. That the Board acted in excess of its actual authority does not save it from liability for the competitive injury that results from its actions. The Supreme Court rejected this defense in *Hydrolevel*. As noted previously, *Hydrolevel* was an antitrust suit against ASME, a standard-setting organization that develops and publishes hundreds of highly influential codes for the engineering industry. A subcommittee of ASME issued a letter asserting that a fuel cutoff device manufactured by plaintiff Hydrolevel was unsafe and violative of the association's code. This representation was false. The subcommittee chairman responsible for the defamatory letter was an executive employed by a competitor to Hydrolevel, and the letter was disseminated for the purpose of impeding Hydrolevel's ability to compete. ASME denied that it was responsible for the injury caused by the letter because the subcommittee chairman had acted outside of his authority as an agent of ASME. The Court rejected this defense as incompatible with the broad remedial purposes of the antitrust laws, explaining: "[A] rule that imposes liability on the standard-setting organization – which is best situated to prevent antitrust violations through the abuse of its reputation – is most faithful to the congressional intent that the private right of action deter antitrust violations." *Hydrolevel*, 456 U.S. at 572; *see also id.* at 571 (apparent authority sufficient for liability where

agents use "one 'unofficial' response to injure seriously the business of a competitor.").

Just as *Hydrolevel* involved a rogue agent of the SSO, the present case involves a rogue agency of the state. Arguably, consumers could have ignored the ASME letter. However, from the point of view of a third person, the communication "seems regular on its face" and the agent "appears to be acting in the ordinary course" of the authority entrusted to the agent. *Id.* at 566. Consumers acted reasonably. And arguably, a non-dentist could have ignored the Board letter. However, a cease and desist order from the Board likewise appears to the recipient as a valid exercise of the Board's authority as a state agency. The non-dentist operators that exited the market acted reasonably. Indeed, the legal system could not function if citizens routinely ignored governmental orders, and this course should not be encouraged either by the Board or by the Federal Trade Commission.

To recap, (i) the Board's conduct is inherently suspect, (ii) the Board has sufficient market power to exclude competition, and (iii) there is direct evidence that the Board's restraints have succeeded in disrupting the operation of a free market. For each and all of these reasons, the challenged restraints are prima facie anticompetitive, and the Board is required to come forward with a legitimate efficiency justification.

IV. THE BOARD'S ASSERTED EFFICIENCY JUSTIFICATIONS ARE INSUFFICIENT

If the Board's conduct is judged to be prima facie anticompetitive, then the Board has the burden of demonstrating a countervailing efficiency justification for its practices. *CDA*, 526 U.S. at 771; *IFD*, 476 U.S. at 459; *NCAA*, 468 U.S. at 113; *Realcomp*, 2009 F.T.C. LEXIS 250 at *48, *74. This Court must assess "[i] whether those purported justifications are legitimate (*i.e.*,

'cognizable' and 'plausible'); [ii] whether they are supported by evidence in the record; and [iii] whether the restraints they impose are reasonably necessary to achieve a legitimate, procompetitive end." *Realcomp*, 2009 F.T.C. LEXIS 250 at *39-40. If even one of these standards is not satisfied, then the Board's efficiency defense must be rejected.

The Board asserts that its campaign to eliminate non-dentist teeth whitening protects the health, safety, and well-being of North Carolina residents, who might otherwise select this low-priced service in lieu of dentist services. This argument fails to satisfy each of the three requirements for a valid efficiency defense. First, the Board's argument amounts to the claim that competition between dentists and non-dentists to provide teeth whitening services is itself undesirable. The Supreme Court and lower courts have judged this precise argument to be non-cognizable as a matter of law. Second, the Board's contention lacks evidentiary support. Third, there are alternative and less restrictive means to achieve the posited objective of protecting consumers from unsuitable providers.

A. The Board's Public Interest Arguments Are Not A Cognizable Antitrust Defense

The rule of reason "does not open the field of antitrust inquiry to any argument in favor of a challenged restraint that may fall within the realm of reason. Instead, it focuses directly on the challenged restraint's impact on competitive conditions." *NSPE*, 435 U.S. at 688. As a consequence, certain types of defenses or justifications do not "warrant consideration" (*PolyGram*, 136 F.T.C. at 345 n.38); they are non-cognizable.

> Cognizable justifications ordinarily explain how specific restrictions enable the defendants to increase output or improve quality, service, or innovation. By contrast, courts . . . have identified classes of justifications that, because they contradict the procompetition aims of the antitrust laws, will not save restraints from condemnation. For, example, a defendant cannot defend restraints of trade

> on the ground . . . that competition itself is unreasonable or leads to socially undesirable results . . . .

Id. at 345-47 (emphasis added). The concept of a non-cognizable public interest defense is illustrated by *NSPE, IFD, Wilk,* and *Virginia Academy.*

In *NSPE,* the Court reviewed a trade association ethics rule that prohibited its members from discussing price with a potential customer until after negotiations had resulted in the initial selection of an engineer. Effectively, the rule prohibited engineers from engaging in competitive bidding. The trade association asserted that competitive bidding was contrary to the public interest, as it would tempt individual engineers to do inferior engineering work, thereby endangering the public health, safety, and welfare. *NSPE,* 435 U.S. at 681, 685. The Court viewed this defense as incompatible with the basic policy of the Sherman Act:

> The Sherman Act reflects a legislative judgment that ultimately competition will produce not only lower prices, but also better goods and services . . . . The assumption that competition is the best method of allocating resources in a free market recognizes that all elements of a bargain – quality, service, safety, and durability – and not just the immediate cost, are favorably affected by the free opportunity to select among alternative offers. Even assuming occasional exceptions to the presumed consequences of competition, the statutory policy precludes inquiry into the question whether competition is good or bad.

Id. at 695. The trade association's claim that competition would lead consumers to choose dangerous engineering services was therefore rejected as a matter of law.

In *IFD,* the Court considered an agreement among dentists to refuse to submit x-rays to dental insurers for use by the insurers in evaluating claims and determining benefits. IFD's justification was that "the provision of x-rays might lead the insurers to make inaccurate determinations of the proper level of care and thus injure the health of the insured patients."

IFD, 476 U.S. at 452. The Court found this argument to be legally flawed:

> The argument is, in essence, that an unrestrained market in which consumers are given access to the information they believe to be relevant to their choices will lead them to make unwise or even dangerous choices. Such an argument amounts to "nothing less than a frontal assault on the basic policy of the Sherman Act."

Id. at 463 (citation omitted). Of particular significance here, the Court rejected the proffered defense notwithstanding the dentists' claim that the challenged restraint served to protect the public from the unauthorized practice of dentistry, explaining that the claim that an excluded service is unlawful "is not, in itself, a sufficient justification for collusion among competitors to prevent it." *Id.* at 465 (*citing Fashion Originators' Guild*, 312 U.S. at 468).

The *Wilk v. American Medical Ass'n*[36] case bears the closest resemblance to the present litigation. Various physicians and medical associations conspired to eliminate competition from the chiropractic profession by denying hospital privileges to chiropractors, declining to give or accept referrals, and refusing to consult with chiropractors on patient care. Defendants offered as justification for their strategy the claim that chiropractic "is dangerous quackery" (*Wilk I*, 719 F.2d at 211, 213) – a contention that the chiropractors vigorously denied. The court declined to be drawn into this debate.[37] Relying on *NSPE*, the court ruled that defendants could not defend against a prima facie showing of competitive harm with the argument that they were seeking to

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[36] *Wilk v. American Medical Ass'n (Wilk I)*, 719 F.2d 207 (7th Cir. 1983); *Wilk v. American Medical Ass'n (Wilk II)*, 895 F.2d 352 (7th Cir. 1990).

[37] *See Wilk II*, 895 F.2d at 365 ("We see the AMA's argument here as yet another invitation to tackle the question of whether chiropractic is 'either good or bad, efficacious or deleterious, quackery or science.' The district court repeatedly stated it was not deciding whether chiropractic was scientific. . . . Like the district court, we do not see our task as deciding whether or not chiropractic is scientific.").

minimize the threat posed by chiropractors to public health, safety, and welfare. "If the jury found that defendants had indeed engaged in economic warfare against chiropractic generally, beyond a refusal to associate in the care of specific patients, it was important that the jury understand that a generalized public interest motive affords no legal excuse for such economic warfare." *Wilk I*, 719 F.2d at 228.[38] *Accord Virginia Acad. of Clinical Psychologists v. Blue Shield of Virginia*, 624 F.2d 476, 485 (4th Cir. 1980) (physicians' exclusion of clinical psychologists is not excused by "an incantation of 'good medical practice'").

The efficiency defense advanced by the Board in this case is indistinguishable from the public interest defenses judged to be non-cognizable in *NSPE*, *IFD*, *Wilk*, and *Virginia Academy*. In the Board's view, the public health and safety are threatened by non-dentist teeth whitening (much like the threat said to be posed by low-priced engineers, insurance companies, chiropractors, and psychologists); the product should, in the Board's view, be eliminated. But this is a judgment that antitrust law removes from rivals and entrusts to the market (and/or the State). The inquiry mandated by the rule of reason is whether the restraint is one that promotes competition, or one that restrains competition. Antitrust law prohibits the Board from displacing market-based outcomes regarding the mix of products to be offered with collusive determinations that certain products (here non-dentist teeth whitening) should not be available to willing consumers.[39] The Board's contention that non-dentist teeth whitening is undesirable is a

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[38] The *Wilk I* court ruled that defendants could adopt rules reasonably tailored rules to protecting their own patients, restraints that embodied a "patient care" motive (as contrasted with an illegitimate "public interest motive"). 719 F.2d at 228-29. This patient care defense is inapplicable here. The restraints adopted by the Board are not aimed at protecting the patients of Board members. These restraints govern throughout North Carolina and affect all consumers.

[39] *See PolyGram*, 136 F.T.C. at 346-47 & n.40.

non-cognizable defense; it does not overcome a prima facie case of illegality.

Of course, the federal antitrust laws do not bar a State from banning a product that it determines to be harmful. North Carolina may ban teeth whitening, and North Carolina may empower the Board to implement such a policy. Pursuant to the state action doctrine, "anticompetitive regulation is allowed to withstand antitrust challenge as long as a court is satisfied that the restraint at issue is truly" that of the State. *State Action Opinion* at 6. "[N]on-sovereign defendants invoking the state action defense" – defendants such as the Board – must demonstrate that "their challenged conduct truly comports with a state decision to forgo the benefits of competition to pursue alternative goals." *State Action Opinion* at 1. The Board failed to make this demonstration. The Board's campaign against non-dentist providers is therefore presumed to represent the Board's pursuit of its own interests and objectives.[40]

The Board's efficiency defenses are invalid as a matter of law.

B. The Board's Public Interest Argument Lacks Evidentiary Support

Not only is the Board's public interest defense non-cognizable, the claim that non-dentist teeth whitening is inherently dangerous to the public is not supported by record evidence. Unsubstantiated claims of consumer harm – whether uttered by the Board's counsel or the Board's expert witness – are insufficient to establish an antitrust defense. This proposition is illustrated by *IFD* and *Wilk*.

In *IFD*, the Commission held that (assuming away the non-cognizability issue) the

[40] *State Action Opinion* at 7 (Board may be presumed to be acting on its own behalf); *id.* at 13 ("Absent some form of state supervision, we lack assurance that the Board's efforts to exclude non-dentists from providing teeth whitening services in North Carolina represent a sovereign policy choice to supplant competition rather than an effort to benefit the dental profession.").

respondent was obliged to present evidence to support its claim that supplying x-rays to insurance companies would lead the insurers to make dangerous choices regarding the course of treatment for patients:

> We note at the outset that the burden of proving sufficient justification for restraints which have been shown substantially to harm competition rests with respondents. Such justifications cannot be speculation only but must be established by record evidence in order to be considered an adequate justification for otherwise anticompetitive behavior.

In re Indiana Fed'n of Dentists, 101 F.T.C. 57, 175 (1983). Yet, at trial, the dentists produced no evidence of erroneous treatment decisions attributable to the misuse of x-rays, and no evidence that any consumer had in fact been harmed. *Id.* at 177. The Commission therefore declined to credit the asserted efficiency defense, and judged the inherently suspect restraint to be unlawful. *Id.* at 175-78. The Supreme Court affirmed, specifically noting that the respondent had failed to introduce sufficient evidence to validate its efficiency defense. *IFD*, 476 U.S. at 464.[41]

In *Wilk II*, an expert witness for the AMA advanced the theory that the doctors' boycott of chiropractors was a form of "nonverbal communication" that dispelled consumer confusion about the differences between medical physicians and chiropractors. However, no evidence of consumer confusion was presented at trial. The expert neither conducted nor cited any surveys of consumer opinion to show that consumers were confused about the differences between

[41] Other Supreme Court cases in which an efficiency defense was rejected for lack of supporting evidence include: *NCAA*, 468 U.S. at 114 ("There is therefore no predicate in the findings for petitioner's efficiency justification."); and *Maricopa*, 457 U.S. at 353 ("[N]othing in the record even arguably supports the conclusion that this type of insurance program could not function if the fee schedules were set in a different way.").

medical physicians and chiropractors. Indeed, the expert "testified that an empirical study could not even be performed" to test his theory. *Wilk II*, 895 F.2d at 361. As the expert's "personal opinion" was not supported by empirical evidence, the trial court rejected this testimony as speculative; the Court of Appeals affirmed this conclusion. *Id.* at 362.

In *IFD* and *Wilk*, the defendants' efficiency defense was rejected because it lacked empirical support in the record. In the present case, the Board's defense is likewise unproven. The evidence shows that non-dentist teeth whitening poses no greater risk to consumer well-being than dentist-provided teeth bleaching. Over the last 20 years, millions upon millions of consumers have whitened their teeth without dentists' involvement; and yet, published clinical reports do not demonstrate substantial or non-transient harm to consumers. Indeed, there is no credible evidence that non-dentist teeth whitening poses any material safety risk at all.

As set forth more fully in the Complaint Counsel's Proposed Findings of Fact:

- The FDA categorizes peroxides used in teeth bleaching as cosmetics, not drugs.
- The side-effects of bleaching (dentinal hypersensitivity and gingival irritation) are transitory and of no clinical significance.
- Non-dentist teeth whitening does not damage either the enamel or the pulpal health of the teeth.
- Hydrogen peroxide occurs naturally in the human body, and peroxide allergy is therefore extremely rare. Non-dentist teeth whitening is not known to have contributed to any instance of anaphylactic reaction among consumers.
- Non-dentist teeth bleaching protocols describe and require sanitation and infection control procedures that include disinfection, gloving, customer self-application of pre-packaged materials, and other measures. There is no known incident of passage of any communicable disease in connection with non-dentist teeth whitening.
- There are no reports of systemic toxicity resulting from non-dentist teeth whitening.

- No one is aware of even a single instance in which a consumer was injured because non-dentist teeth whitening masked a dental problem (pathology) that could only be identified by discoloration. Dr. Haywood theorized that such injury is possible, but acknowledged that his theory has not been proven and cannot be proved.

In brief, the Board's expert witness generated many tales of possible consumer harm, but no such hypothesis is supported by empirical evidence. Indeed, as in *Wilk*, the Board's expert testified that an empirical study could not even be performed to test his theory. (Haywood, Tr. 2729-2730, 2734-2735). Over some twenty years, and perhaps a hundred million teeth whitening events, no significant consumer injury has been demonstrated.

C. The Board's Restraints Are Not Reasonably Necessary

If the Board's efficiency defenses were cognizable (they are not), and if the Board's professed concerns about public health and safety were adequately supported by empirical evidence (they are not), then this Court would proceed to consider whether the restraints adopted by the Board are appropriate in scope.

An efficiency defense is valid only if the challenged conduct is reasonably necessary in order to achieve the legitimate objective identified by the respondent. *Realcomp*, 2009 F.T.C. LEXIS 250 at *39-40. *Accord Broadcast Music, Inc. v. CBS, Inc.*, 441 U.S. 1, 19-21 (1979) (blanket license was "an obvious necessity" for achieving integrative efficiencies, and joint setting of price was "necessary" for the blanket license); Antitrust Guidelines for Collaborations Among Competitors ¶ 3.36(b) (April 2000) ("The Agencies consider only those efficiencies for which the relevant agreement is reasonably necessary."); 7 Philip E. Areeda & Herbert Hovenkamp, *Antitrust Law* ¶ 1505, at 370 (3d cd. 2003) ("To be reasonably necessary, the

restraint must not only promote the legitimate objective but must do so significantly better than the available less restrictive alternatives."). The Board has failed to carry its burden; for this additional reason, its exclusionary conduct should be condemned.

The subject of alternatives to a ban on non-dentist teeth whitening was addressed by Professors Giniger and Kwoka.

With regard to the claim that consumers are not fully informed about the nature and risks of non-dentist teeth whitening, state dental boards could require teeth whitening operations to distribute to customers a fact sheet disclosing, *inter alia*, that: the operator is not a licensed dentist or an expert in oral health; tooth decay and other health problems should be treated prior to whitening; discoloration of teeth may be the result of clinical problems; some types of discoloration do not respond to whitening; and the bleaching agent can cause irritation of the gums. (CX0487 at 008-010; Kwoka, Tr. 1086-1087; CX0631 at 011). Certainly, this type of consumer education is less restrictive of competition than entirely eliminating non-dentist services.[42] If the Board does not have the requisite authority to mandate these disclosures, it may advocate for such authority from the North Carolina legislature.

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[42] *See Wilk v. American Medical Ass'n*, 671 F. Supp. 1465, 1483 (N.D. Ill. 1987):

> The final question is whether this concern for scientific method in patient care could have been adequately satisfied in a manner less restrictive of competition. . . . The AMA presented no evidence that a public education approach or any other less restrictive approach was beyond the ability or resources of the AMA or had been tried and failed. . . . The AMA and other medical societies have managed to change America's health-related conduct by what appears to be good public relations work and there has been no proof that a similar campaign would not have been at least as effective as the boycott in educating consumers about chiropractic and the AMA's concern for scientific method.

With regard to the claim that non-dentist teeth whitening operations could be better regulated, there are at least two possible solutions: (i) require appropriate training for employees of tooth whitening businesses, and (ii) authorize dental boards to issue permits to teeth whitening businesses.[43] The Board is aware of a third option: notify the state or local health boards of any suspected problems. (CX0556 (Burnham, Dep. at 166); CX0554 (Allen, Dep. at 159); CX0570 (Owens, Dep. at 22)). To date, the Board has declined to seek assistance from any health board, suggesting that the Board knows that its complaints are baseless. In any event, regulating non-dentist operations is of course less restrictive than eliminating these businesses. (Kwoka, Tr. 1149-1150, 1224-1225, 1238).

Finally, over the course of the trial, Board witnesses identified a slew of hypothetical problems that supposedly could arise in connection with non-dentist teeth whitening operations (and many other businesses): failure to maintain sanitary conditions; failure to safeguard confidential consumer information; failure to maintain adequate levels of insurance; requiring customers to waive liability. (Kwoka, Tr. 1057-1059; Baumer, Tr. 1926-1928, 1932, 1955-1956, 1958; CX0826 (Baumer, Dep. at 52-55, 77-78, 126, 215). Like the previously discussed rationales for a ban on teeth whitening, there is no evidence that any of these problems exist. If the problems do exist, they may be remedied by educating operators and/or with narrowly tailored legislation or regulation. For example, the Board could require or advocate regulations requiring non-dentist teeth whitening businesses to observe sanitary requirements; to safeguard confidential consumer information; to maintain adequate levels of insurance; and/or to forgo

[43] That the aforementioned alternatives are feasible is confirmed by an ADA document that lays out potential alternatives to a ban. (CX0487 at 010).

waivers of liability. (Kwoka, Tr. 1057-1058, 1087-1089, 1149-1150). This is common sense. These are less restrictive alternatives.

V. THE BOARD'S ANTICOMPETITIVE CONDUCT OCCURRED IN, OR HAD AN AFFECT ON, INTERSTATE COMMERCE

The Board's actions are in or affect interstate commerce, as required to establish jurisdiction under Section 5 of the FTC Act.[44]

The jurisdictional reach of the FTC Act "is coextensive with the broad-ranging power of Congress under the Commerce Clause." *Chatham Condo Ass'n v. Century Village, Inc.*, 597 F.2d 1002, 1007 (5th Cir. 1979) (*citing Burke v. Ford*, 389 U.S. 320, 321-22 (1967)). Jurisdiction is proper where the alleged conspiracy, if successful, would affect a "not insubstantial" amount of interstate commerce. *Summit Health, Ltd. v. Pinhas*, 500 U.S. 322, 330 (1991); *McLain v. Real Estate Board*, 444 U.S. 232, 246 (1980).

More specifically, the Commission has jurisdiction where the respondent's scheme, if successful, could be expected to have a substantial effect on the flow of interstate payments. For example, in *NTSP*, 140 F.T.C. at 727, the Commission found a sufficient effect on interstate commerce where an agreement among physicians to maintain fee levels, if successful, "could be expected to affect the flow of interstate payments [to the conspiring physicians] from out-of-state payors." *See also Summit Health*, 500 U.S. 322, 328-33 (conspiracy to force an ophthalmologist out of business affects interstate commerce by reducing payments from out-of-state patients); *Hospital Bldg Co. v. Trustees of Rex Hospital*, 425 U.S. 738, 744 (1976) (blocking relocation of

[44] Section 5 of the FTC Act prohibits unfair methods of competition "in or affecting commerce." 15 U.S.C. § 45(a)(1). The Commission utilizes cases interpreting jurisdiction under the Sherman Act in analyzing its own jurisdiction under Section 5. *In re North Texas Specialty Physicians*, 140 F.T.C. 715, 726-27 & n. 9 (2005).

a hospital affects interstate commerce by reducing hospital's payments for out-of-state medicine and supplies).

The Board's campaign against non-dentist teeth whitening operations has reduced – and will in the future reduce – the amount of teeth bleaching equipment and supplies that non-dentist operators in North Carolina purchase from out-of-state suppliers. The Board's actions have also deterred out-of-state prospective entrants who had expressed interest in opening non-dentist teeth whitening operations in North Carolina. The campaign has reduced – and will in the future reduce – the volume of rental payments that non-dentist operators in North Carolina pay to out-of-state mall owners. This is sufficient to establish the Commission's jurisdiction over this matter.

VI. THE BOARD'S CONTENTION THAT NON-DENTIST TEETH WHITENING IS THE PRACTICE OF DENTISTRY IS NOT A DEFENSE, AND IS INACCURATE

The Board asserts that it is permissible to exclude non-dentist teeth whitening from the marketplace because these operators are engaged in removing stains from teeth, and the removal of stains allegedly constitutes the unauthorized practice of dentistry under North Carolina law. This argument fails in three respects.

First, in the absence of a valid state action defense, the Board's efforts to eliminate assertedly "illegal" competition are not immune from antitrust sanctions. *See IFD*, 476 U.S. at 465 ("[That] the unauthorized practice of dentistry . . . [is] unlawful is not, in itself, a sufficient justification for collusion among competitors to prevent it."); *Keifer-Stewart Co. v. Joseph E. Seagram & Sons, Inc.*, 340 U.S. 211, 214 (1951) (alleged illegal conduct of plaintiff "could not legalize the unlawful combination by [defendants] nor immunize them against liability to those

they injured"); *Fashion Originators' Guild*, 312 U.S. at 468 (claim that certain clothing manufacturers are engaged in unfair competition does not justify a conspiracy to exclude these manufacturers); *Sweeney v. Athens Reg'l Med. Center*, 709 F. Supp. 1563, 1575 (M.D. Ga. 1989) (claim that plaintiff nurse-midwife is engaged in an illegal business does not justify a conspiracy of physicians to exclude plaintiff).

Second, the non-dentists targeted by the Board are not in fact engaged in the removal of stains as is claimed by the Board. The North Carolina Dental Act defines dentistry as including the removal of stains from teeth. What is contemplated by the statute is the scraping of stains from the teeth with abrasive instruments, and not the application of bleach (whether self-application at home, or assisted application at a spa or salon). Teeth bleaching lightens the appearance of a stain on the teeth, but does not remove the stain. The stain molecules remain in place on the customer's teeth.

Third, even if teeth bleaching were determined to be the removal of stains under North Carolina law, this still would not be sufficient to show that non-dentist operators are violating the Dental Act. In response to the hostility of dentists and the opposition of dental boards around the country, non-dentists in North Carolina and elsewhere have adapted their operations such that the consumer, rather than the operator of the facility, is actually performing the teeth bleaching: the consumer accepts a pre-packaged tray, opens the package, inserts the tray in mouth, and removes the tray after the assigned time. The ancillary role of the non-dentist operator is to provide the consumer with a pre-packaged tray, information, and a well-maintained facility (including, for example, set-up and clean-up services).

North Carolina courts have never ruled that teeth bleaching involves the removal of

stains, and North Carolina courts have never ruled that the assistance provided by a non-dentist operator in connection with teeth bleaching by the consumer constitutes the practice of dentistry. Why have these issues not been formally resolved? "The Board evaded judicial review of its decision to classify teeth whitening as the practice of dentistry by proceeding directly to issue cease and desist orders purporting to enforce that unsupervised decision." *State Action Opinion* at 17.

In sum, it is likely that the non-dentists excluded by the Board are not engaged in illegal activity. Further, even if the non-dentists were engaged in illegal activity, this alone would not constitute a valid antitrust defense.

VII. THE TENTH AMENDMENT DOES NOT IMMUNIZE THE ANTICOMPETITIVE CONDUCT OF THE BOARD

The Board asserts that a finding that the Board has violated the antitrust laws would violate the Tenth Amendment.[45] This is incorrect.

Whether and to what extent the Tenth Amendment limits Congressional authority under the Commerce Clause to regulate the sovereign activities of a State is a complicated question. *See Garcia v. San Antonio Metro. Transit Auth.*, 469 U.S. 528, 556 (1985) (declining to "define what affirmative limits the constitutional structure might impose on federal action affecting the States under the Commerce Clause"). What is clear, however, is that with regard to an antitrust claim against a governmental entity, any defense under the Tenth Amendment extends no further

[45] The Tenth Amendment of the United States Constitution provides:

> The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people. U.S. CONST. Amend. X.

than the state action defense. *Mercy-Peninsula Ambulance, Inc. v. County of San Mateo*, 592 F. Supp. 956, 965 (N.D. Cal. 1984) ("[B]ecause the goals of the Parker exemption and the Tenth Amendment are analogous – to protect state sovereignty – a finding that a local government's actions are not entitled to state action immunity compels the conclusion that they do not violate the Amendment . . . ."); *Springs Ambulance Service, Inc. v. City of Rancho Mirage*, No. CV82-5917CBM, 1983 WL 1878, at *9 (C.D. Cal. Sept. 27, 1983) ("This court does not view the Sherman Act as a threat . . . to the sovereignty of the state of California . . . . This is because the court believes that the doctrine of state action immunity amply protects defendants from all of the Tenth Amendment abuses they cite."), *rev'd on other grounds,* 745 F.2d 1270 (9th Cir. 1983). *See also Omni Outdoor Advertising, Inc. v. Columbia Outdoor Advertising, Inc.*, 566 F. Supp. 1444, 1447 (D.S.C. 1983) (enforcement of Sherman Act against a municipality does not violate the Tenth Amendment).

The Commission has previously determined that the requirements of the state action defense have not been satisfied by the Board in this case. *State Action Opinion* at 17. That is, the anticompetitive restraints implemented by the Board and challenged in the Complaint do not represent the sovereign policy choice of the State of North Carolina. It follows that the Tenth Amendment offers no immunity.

VIII. REMEDY

Complaint Counsel has proven that the Board has violated Section 5 of the FTC Act by excluding competition from non-dentist providers of teeth-whitening services. When a violation of Section 5 is established, the Court is empowered to enter an appropriate order to prevent a recurrence of the violation. *PolyGram*, 136 F.T.C. at 379. The Court has wide discretion in its

choice of a remedy. *FTC v. National Lead Co.*, 352 U.S. 419, 428 (1957); *Jacob Siegal & Co. v. FTC*, 327 U.S. 608, 611 (1946). The Court "is not limited to prohibiting the illegal practice in the precise form in which it is found to have existed in the past," but "must be allowed effectively to close all roads to the prohibited goal, so that its order may not be by-passed with impunity." *FTC v. Ruberoid Co.*, 343 U.S. 470, 473 (1952). The remedy selected must be reasonably related to the violation found to exist. *Id.*; *Jacob Siegal*, 327 U.S. at 613.

An appropriate order in this matter should contain the following provisions.

1. Require the Board to cease and desist from any action that may restrain the provision of teeth whitening services by non-dentists.

2. Require the Board to cease and desist from ordering any non-dentist provider of teeth whitening services to cease providing teeth whitening services.

3. Require the Board to cease and desist from communicating to any non-dentist provider of teeth whitening services: (i) that such non-dentist provider is violating, has violated, or may be violating North Carolina law by providing teeth whitening services; or (ii) that the provision of teeth whitening services by a non-dentist provider is a violation of North Carolina law.

4. Require the Board to include in all correspondence with any non-dentist provider of teeth whitening services, including any threat to file a lawsuit, that the Board does not have the authority to determine whether the law has been violated, and that only a court can make that determination and then assess penalties, if judged appropriate.

5. Require the Board to cease and desist communicating to a lessor of commercial property or any other person: (i) that the provision of teeth whitening services by a non-dentist

provider is a violation of North Carolina law, or (ii) that any non-dentist provider of teeth whitening services is violating, has violated, or may be violating North Carolina law by providing teeth whitening services.

6. Require the Board to provide notice on its website of the Complaint and Order in this matter, as well as a public notice to the effect that, as of [a specified date], the Board was aware of no scientific studies showing that any risks associated with teeth whitening are greater for non-dentists than they are for dentists.

The order should include a limited proviso that permits the Board to send a proper litigation threat letter to a person when: (i) the Board has a good faith belief that such person is violating North Carolina law, and (ii) the Board has a good faith intention to initiate a judicial action.

IX. CONCLUSION

For all of the foregoing reasons, Complaint Counsel requests that this Court rule that the North Carolina State Board of Dental Examiners has violated Section 5 of the Federal Trade Commission Act, and enter a cease and desist in the form attached hereto.

Respectfully submitted,

s/ Richard B. Dagen
Richard B. Dagen
Counsel Supporting the Complaint
Federal Trade Commission
Bureau of Competition
Washington, D.C. 20580
Phone: (202) 326-2628
Facsimile: (202) 326-3496

Dated: April 22, 2011

UNITED STATES OF AMERICA
BEFORE THE FEDERAL TRADE COMMISSION
OFFICE OF ADMINISTRATIVE LAW JUDGES

In the Matter of	)	**PUBLIC**
THE NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS,	)	**DOCKET NO. 9343**
Respondent.	)	

[PROPOSED] ORDER

I.

IT IS ORDERED that, as used in this Order, the following definitions shall apply:

A. "Board" means the North Carolina State Board of Dental Examiners ("NCSBDE"), its officers, directors, members, employees, agents, attorneys, representatives, successors, and assigns; and the subsidiaries, divisions, groups, and affiliates controlled by it; and the respective officers, directors, members, employees, agents, attorneys, representatives, successors, and assigns of each.

B. "Communicate" or "Communicating" means exchanging, transferring, or disseminating any information, without regard to the manner or means by which it is accomplished.

C. "Communication" means any information exchange, transfer, or dissemination, without regard to the means by which it is accomplished, including, without limitation, oral or written, in any manner, form, or transmission medium.

D. "Dental Practice Act" means any legislation that is administered by the Board, including, North Carolina General Statutes, Chapter 90, Article 2 (Dentistry) (N.C. Gen. Stat. §§ 90-22 - 90-48.3 (2010)) and Article 16 (Dental Hygiene Act) (N.C. Gen. Stat. §§ 90-221 - 90-233.1 (2010)).

E. "Dentist" means any individual holding a license, issued by the Board, to practice dentistry in North Carolina.

F. "Direct" or "Directing" means to order, direct, command or instruct.

G. "Non-Dentist Provider" means any Person other than a Dentist engaged in the provision, distribution or sale of any Teeth Whitening Goods or Teeth Whitening Services.

H. "Person" means both natural persons and artificial persons, including, but not limited to, corporations, unincorporated entities.

I. "Principal Address" means either (i) primary business address, if there is a business address, or (ii) primary residential address, if there is no business address.

J. "Teeth Whitening Goods" means any formulation containing a peroxide bleaching agent, whether or not used in conjunction with an LED light source, and any other ancillary products used in the provision of Teeth Whitening Services.

K. "Teeth Whitening Services" means whitening teeth through the use of a formulation containing a peroxide bleaching agent, whether or not used in conjunction with an LED light source.

L. "Third Party" means any Person other than NCSBDE.

II.

IT IS FURTHER ORDERED that Respondent, directly or indirectly, or through any corporate or other device, in connection with the provision of Teeth Whitening Services in or affecting commerce, as "commerce" is defined in Section 4 of the Federal Trade Commission Act, 15 U.S.C. § 44, cease and desist from:

A. Directing a Non-Dentist Provider to cease providing Teeth Whitening Goods or Teeth Whitening Services;

B. Engaging in any action that restrains, restricts, inhibits, deters, or otherwise excludes the provision of Teeth Whitening Goods or Teeth Whitening Services by a Non-Dentist Provider;

C. Communicating to a Non-Dentist Provider that: (i) such Non-Dentist Provider is violating, has violated, or may be violating the Dental Practice Act by providing Teeth Whitening Goods or Teeth Whitening Services; or (ii) the provision of Teeth Whitening Goods or Teeth Whitening Services by a Non-Dentist Provider is a violation of the Dental Practice Act;

D. Communicating to a prospective Non-Dentist Provider that: (i) a Non-Dentist Provider would or might be violating the Dental Practice Act by providing Teeth Whitening Goods or Teeth Whitening Services; or (ii) the provision of Teeth Whitening Goods or Teeth Whitening Services by a Non-Dentist Provider would or might be a violation of the Dental Practice Act;

E. Communicating to a lessor of commercial property or any other Third Party that (i) the provision of Teeth Whitening Goods or Teeth Whitening Services by a Non-Dentist Provider is a violation of the Dental Practice Act, or (ii) that any Non-Dentist Provider is violating, has violated, or may be violating the Dental Practice Act by providing Teeth Whitening Goods or Teeth Whitening Services;

F. Communicating to an actual or prospective manufacturer, distributor, or seller of Teeth Whitening Goods used by Non-Dentist Providers, or to any other Third Party that (i) the provision of Teeth Whitening Goods or Teeth Whitening Services by a Non-Dentist Provider is a violation of the Dental Practice Act, or (ii) that any Non-Dentist Provider is violating, has violated, or may be violating the Dental Practice Act by providing Teeth Whitening Goods or Teeth Whitening Services; and

G. Encouraging, suggesting, advising, pressuring, inducing, or attempting to induce any Person to engage in any action that would be prohibited to Respondent by Paragraphs II.A through II.F above;

Provided, however, that nothing in this Order prohibits the Board from:

(i) investigating a Non-Dentist Provider for suspected violations of the Dental Practice Act;

(ii) filing or causing to be filed, a court action against a Non-Dentist Provider for an alleged violation of the Dental Practice Act pursuant to N.C. Gen. Stat. §§ 90-40, 90-40.1, or 90-233.1; or

(iii) pursuing any administrative remedies against a Non-Dentist Provider pursuant to and in accordance with the North Carolina Annotated Code;

Provided further, that nothing in this Order prohibits the Board from Communicating to a Third Party:

(i) notice of its bona fide intention to file a court action against that Person for a suspected violation of the Dental Practice Act with regard to Teeth Whitening Goods or Teeth Whitening Services; or

(ii) notice of its bona fide intention to pursue administrative remedies with regard to Teeth Whitening Goods or Teeth Whitening Services,

so long as such Communication includes, with equal prominence, the paragraph included in Appendix A to this Order.

III.

IT IS FURTHER ORDERED that Respondent shall:

A. Within thirty (30) days from the date this Order becomes final, send a copy of this Order and the Complaint by first-class mail with delivery confirmation or electronic mail with return confirmation to:

1. each Board member; and

2. each officer, director, manager, representative, agent, attorney, and employee of the Board;

B. Distribute by first-class mail, return receipt requested, a copy of this Order and the Complaint to each individual who becomes a Board member, or an officer, director, manager, attorney, representative, agent or employee of Board, and who did not previously receive a copy of this Order and the Complaint from Respondent, within ten (10) days of the time that he or she assumes such position;

C. Within thirty (30) days from the date this Order becomes final, send a copy of the letter, on the Board's official letterhead, with the text included in Appendix B to this Order by first-class mail with delivery confirmation or electronic mail with return confirmation to:

1. each Person, including without limitation actual or prospective Non-Dentist Providers, manufacturers of goods and services used by Non-Dentists Providers, or any other Third Party, to whom the Board Communicated a cease-and-desist order, letter; or other similar Communication;

2. each Person, including without limitation actual or prospective lessors of commercial property or any other Third Party, to whom the Board Communicated that (i) the provision of Teeth Whitening Goods or Teeth Whitening Services by a Non-Dentist Provider is a violation of the Dental Practice Act, or (ii) that any Non-Dentist Provider is violating, has violated, or may be violating the Dental Practice Act by providing Teeth Whitening Goods or Teeth Whitening Services; and

3. any other Third Party to whom, or with whom, the Board Communicated substantially the same information set forth in C.1 and 2 of this Paragraph III;

D. Within sixty (60) days from the date this Order becomes final, Respondent shall arrange with the North Carolina Board of Cosmetic Art Examiners for the notice included as Appendix C to this Order to appear on the website of that Board for a period of six (6) months;

Provided, however, should Respondent be unable within sixty (60) days to arrange with the North Carolina Board of Cosmetic Art Examiners for such notice to appear on that Board's website, Respondent shall within ninety (90) days from the date this Order becomes final: (1) obtain from the North Carolina Board of Cosmetic Art Examiners its most current list of licensees; and (2) send the Appendix C notification by first-class mail with delivery confirmation or electronic mail with return confirmation to each licensee on that current list;

E. For five (5) years from the date this Order becomes final annually:

1. publish in any official report or newsletter sent to all North Carolina Dentists a copy of the Order and the Complaint with such prominence as is given to other regularly featured articles; and

2. post on the home page of any official website with prominence equal to that the Board gave to the notice it posted regarding the FTC investigation of this matter the following notice with the designated links:

NOTICE: As of the date the record closed in the Federal Trade Commission proceeding, the Board was not aware of any scientific, clinical or empirical, studies anywhere in this country that showed that teeth whitening services provided by non-dentists were any less safe than teeth whitening services provided by dentists. The harms that had been reported to the Board by consumers of non-dentist teeth whitening services were not substantiated, and the Board was not aware of any other systemic report of such harm from anywhere else in this country at that time. The FTC has ordered the Board to post

this notice in response to the anticompetitive practices enumerated in the FTC Complaint. To read the FTC Order and Complaint click here [required links].

IV.

IT IS FURTHER ORDERED that Respondent shall file verified written reports within sixty (60) days from the date this Order becomes final, annually thereafter for three (3) years on the anniversary of the date this Order becomes final, and at such other times as the Commission may by written notice require. Each report shall include, among other information that may be necessary:

A. The identity, including address and telephone number, of each Non-Dentist Provider, and any other Third Party, that the Board Communicated with during the relevant reporting period regarding Teeth Whitening Goods or Teeth Whitening Services;

B. Copies of all Communications with any Non-Dentist Provider, and any other Third Party regarding the provision of Teeth Whitening Goods or Teeth Whitening Services;

C. Copies of the delivery confirmations or electronic mail with return confirmations required by Paragraph III. A and B; and

D. A detailed description of the manner and form in which Respondent has complied, and is complying, with this Order.

V.

IT IS FURTHER ORDERED that Respondent shall notify the Commission of any change in its principal address within twenty (20) days of such change in address.

VI.

IT IS FURTHER ORDERED that, for the purpose of determining or securing compliance with this Order, and subject to any legally recognized privilege, and upon written request and upon five (5) days notice to NCSBDE, that NCSBDE shall, without restraint or interference, permit any duly authorized representative of the Commission:

A. Access, during office hours of NCSBDE and in the presence of counsel, to all facilities and access to inspect and copy all books, ledgers, accounts, correspondence, memoranda, and all other records and documents in the possession, or under the control, of NCSBDE relating to compliance with this Order, which copying services shall be provided by NCSBDE at its expense; and

B. To interview officers, directors, or employees of NCSBDE, who may have counsel present, regarding such matters.

VII.

IT IS FURTHER ORDERED that this Order shall terminate twenty (20) years from the date it is issued.

ORDERED:

D. Michael Chappell
Chief Administrative Law Judge

Date:

Appendix A

The Federal Trade Commission, by its Order of _____, 2011, has directed the Board to provide you with the following Notice. The Board hereby notifies you that the opinion of the Board expressed in this communication has no legal effect. The Board does not have the authority to determine whether you have violated, or may be violating, any law. Only a court has the right to make such a determination, and, if appropriate, impose a remedy or penalty for such violation.

Further, prior to the initiation of any court action by the Board, you have the right to request a Declaratory Ruling from the Board, pursuant to 21 N.C.A.C. 16N .0400 and N.C. Gen. Stat. § 150B-4, regarding whether your method of providing teeth whitening goods or services is lawful.

You are further notified that your right to a declaratory ruling from the Board is additional to any other legal rights that you may already have to establish the legality of your teeth whitening goods or services. A complete copy of the Federal Trade Commission's Complaint and Decision and Order are available on the Commission's website, http:\\www.ftc.gov.

Appendix B

(Letterhead of NCSBDE)

(Name and Address of the Recipient)

Dear (Recipient):

As you may know, the Federal Trade Commission issued an administrative complaint in 2010 against the Board challenging the legality of the Board's activities directed at the elimination of dental teeth whitening services in North Carolina by non-dentists. At the conclusion of that administrative proceeding, the Commission issued a Decision and Order directing that the Board, among other things, cease and desist from certain activities involving teeth whitening by non-dentists and take certain remedial actions, of which this letter is one part. A complete copy of the Federal Trade Commission's Complaint and Decision and Order are available on the Commission's website, http:\\www.ftc.gov.

You are receiving this letter because you previously received from the Board either: (1) a letter directing, or ordering, you to cease and desist the unlicensed provision of dental teeth whitening services, or selling dental teeth whitening goods or services to non-dentist teeth whiteners in violation of the Dental Practice Act, N.C. Gen. Stat. §§ 90-29(b)(2), 90-40, and/or 90-40.1; or (2) a letter advising you that (i) a non-dentist would or might be violating the Dental Practice Act by providing teeth whitening goods or services; or (ii) the provision of teeth whitening goods or services by a non-dentist would or might be a violation of the Dental Practice Act, N.C. Gen. Stat. §§ 90-29(b)(2), 90-40, and/or 90-40.1.

The Board hereby notifies you that the prior letter you received from the Board only expressed the opinion of the Board, and that such opinion has no legal effect. The Board does not have the authority to determine whether you are violating, have violated, or may be violating, any law. Only a court has the right to make such a determination, and, if appropriate, impose a remedy or penalty for such violation. Further, you have the right to request a Declaratory Ruling from the Board, pursuant to 21 N.C.A.C. 16N .0400 and N.C. Gen. Stat. § 150B-4, regarding whether a particular method of providing teeth whitening goods or services is lawful. You are further notified that your right to a declaratory ruling from the Board is additional to any other legal rights that you may already have to establish the legality of any particular method of providing teeth whitening goods or services.

Appendix C

Teeth Whitening Notice.

As you may know, the Federal Trade Commission issued an administrative complaint in 2010 against the North Carolina State Board of Dental Examiners challenging the legality of the Dental Board's activities directed at the elimination of dental teeth whitening services in North Carolina by non-dentists. At the conclusion of that administrative proceeding, the Commission issued a Decision and Order directing that the Dental Board, among other things, cease and desist from certain activities involving teeth whitening by non-dentists and take certain remedial actions, of which this Notice is one part. A complete copy of the Federal Trade Commission's Complaint and Decision and Order are available on the Commission's website, http://www.ftc.gov.

In 2007, the Cosmetology Board, at the request of the Dental Board, displayed a "Teeth Whitening Bulletin" on the Cosmetology Board's website advising cosmetologists and estheticians "that any process that 'removes stains, accretions or deposits from human teeth' constitutes the practice of dentistry. . . Taking impressions for bleaching trays also constitutes the practice of dentistry. . ." That Bulletin further advised that it was a misdemeanor for anyone other than a licensed dentist to provide those services.

The Dental Board hereby notifies you that the prior Bulletin, described above, only expressed the opinion of the Dental Board, and that such opinion has no legal effect. The Dental Board does not have the authority to determine whether you are violating, have violated, or may be violating, any law. Only a court has the right to make such a determination, and, if appropriate, impose a remedy or penalty for such violation. Further, you have the right to request a Declaratory Ruling from the Dental Board, pursuant to 21 N.C.A.C. 16N .0400 and N.C. Gen. Stat. § 150B-4, regarding whether a particular method of providing teeth whitening goods or services is lawful. You are further notified that your right to a declaratory ruling from the Dental Board is additional to any other legal rights that you may already have to establish the legality of any particular method of providing teeth whitening goods or services.

CERTIFICATE OF SERVICE

I hereby certify that on April 22, 2011, I filed the foregoing document electronically using the FTC's E-Filing System, which will send notification of such filing to:

Donald S. Clark
Secretary
Federal Trade Commission
600 Pennsylvania Ave., NW, Rm. H-113
Washington, DC 20580

I also certify that I delivered via electronic mail and hand delivery a copy of the foregoing document to:

The Honorable D. Michael Chappell
Administrative Law Judge
Federal Trade Commission
600 Pennsylvania Ave., NW, Rm. H-110
Washington, DC 20580

I further certify that I delivered via electronic mail a copy of the foregoing document to:

Noel Allen
Allen & Pinnix, P.A.
333 Fayetteville Street
Suite 1200
Raleigh, NC 27602
nla@Allen-Pinnix.com

Counsel for Respondent
North Carolina State Board of Dental Examiners

CERTIFICATE FOR ELECTRONIC FILING

I certify that the electronic copy sent to the Secretary of the Commission is a true and correct copy of the paper original and that I possess a paper original of the signed document that is available for review by the parties and the adjudicator.

April 22, 2011

By: s/ Richard B. Dagen
Richard B. Dagen

Appendix A to Complaint Counsel's Findings of Fact, Conclusions of Law, Post Trial Brief and [Proposed] Order

1. Bryan Boulier, *An Empirical Examination of the Influence of Lisensure and Licensure Reform on the Geographic Distribution of Dentists*," *in* Occupational Licensure and Regulation (S. Rottenberg ed., 1980)

2. Simon Rottenberg, *Introduction, in* Occupational Licensure and Regulation (S. Rottenberg ed., 1980)

3. Shirley Svorny, *Licensing, Market Entry Regulations, in* III Encyclopedia of Law & Economics, The Regulation of Contracts 296 (Boudewijn Bouckaert & Gerrit De Geest ed., 2000)

4. Ronald Bond, John Kwoka, John Phelan, & Ira Whitten, *Self-Regulation in Optometry: The Impact on Price and Quality*, 7 Law & Human Behavior 219 (1983)

5. Ronald Bond, John Kwoka, John Phelan, & Ira Whitten, *Effects of Restrictions on Advertising and Commercial Practice in the Professions: The Case of Optometry* (Bureau of Economics Staff Report, FTC 1980)

6. L. Jackson Brown, Donald House & Kent Nash, *The Economic Aspects of Unsupervised Private Hygiene Practice and its Impact on Access to Care*, ADA Health Policy Resources Center (2005)

7. Sydney Carroll & Robert Gaston, *Occupational Restrictions and the Quality of Service Received*, 47 Southern Econ. J. 959 (1981)

8. Douglas Conrad & Marie Emerson, *State Dental Practice Acts: Implications for Competition*, 5 J. Health Politics, Policy & Law 613 (1981)

9. Arthur DeVany & Wendy Gramm, *The Impact of Input Regulation: The Case of the U.S. Dental Industry*, 25 J.L. & Econ. 367 (1982)

10. Morris Kleiner, *Occupational Licensing,* 14 J. Econ. Perspectives 189 (2000)

11. Morris Kleiner & Robert Kudrle, *Does Regulation Affect Economic Outcomes? The Case of Dentistry*, 43 J.L. & Econ. 547 (2000)

12. Morris Kleiner and Robert Kudrle, *Does Regulation Improve Outputs and Increase Prices? The Case of Dentistry* (NBER Working Paper 5869, 1997)

13. J. Nellie Liang & Jonathan Ogur, *Restrictions on Dental Auxiliaries* (Bureau of Economics Staff Report, FTC 1987)

14. Lawrence Shepard, *Licensing Restrictions and the Cost of Dental Care*, 21 J.L. & Econ.

187 (1978)

15. Deborah Haas-Wilson, *The Effect of Commercial Practice Restrictions: The Case of Optometry*, 29 J.L. & Econ. 165 (1986)

An Empirical Examination of the Influence of Licensure and Licensure Reform on the Geographical Distribution of Dentists

Bryan L. Boulier

State licensing of occupations has long been criticized but has thus far resisted substantial reform. One reason for the successful resistance is that regulated professions dominate the regulatory process and exert considerable influence on reform measures. A second reason is that, with few exceptions, those who urge reform have been unable to demonstrate empirically the benefits of the changes proposed. The purpose of this paper is to measure the consequences of a specific reform proposal—a change in the system of dental licensure that would permit dentists once licensed in at least one state to migrate without restriction to other states. This proposal is called "nationwide reciprocity."

Three considerations prompt the evaluation of this proposal. First, there is concern that dental licensing boards have influenced the geographical distributions of dentists through their powers to limit the number of dentists who are permitted to practice in their jurisdictions and that "the shortage of dentists is accentuated by uneven distribution."[1] Second, nationwide reciprocity has considerable support among dentists, being favored by 68.0 percent of dentists responding to a 1972 survey conducted by the American Dental Association.[2] That dentists recognize their economic interest in the licensing process is demonstrated by the pattern of responses to the questionnaire: dentists residing

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[1] National Advisory Commission on Health Manpower, *Report of the National Advisory Commission on Health Manpower* (Washington, D.C., 1969), p. 497.

[2] American Dental Association, Bureau of Economic Research and Statistics, "Survey of Attitudes on Dental Licensing Procedures," *Journal of the American Dental Association*, vol. 85 (December 1972), pp. 1269–1306.

in states with fees above the national average were less favorable toward nationwide reciprocity than dentists residing in states with below average fees, presumably because reciprocity would result in increased migration of dentists into states with fees above the average.[3] Third, the American Dental Association House of Delegates adopted a resolution in 1975 stating that the American Dental Association, "through its constituent societies, strongly encourages state boards of dentistry to establish criteria by which dentists could be licensed by credentials to permit the freedom of interstate movement while retaining those controls necessary to fulfill the public responsibilities of the respective state boards"[4] and adopted a resolution in 1978 calling for a study to determine the feasibility of estimating the potential impact of nationwide reciprocity on the redistribution of dentists.

In what follows, I describe briefly the dental licensing system, review past studies of licensure, and assemble evidence that suggests that the licensing process has affected the geographical distribution of dentists. I then present an estimate of the effect of nationwide reciprocity on the distribution of dentists, the price and aggregate quantity of dental services produced and consumed, consumer welfare, and dentists' incomes in 1967.

The Licensing System

All states have dental practice acts that establish licensing boards. In general, licensing boards are composed of practicing dentists, with members appointed by the governor of the state upon recommendation or nomination by the state dental society. The boards establish and administer regulations pertaining to the practice of dentistry within their states, including the examination of candidates for licensure. Regulations established by the boards are limited by state dental practice acts,

[3] Correlation of the percentage of dentists in favor of nationwide reciprocity in a state in 1972 with the average fee for a two-sided amalgam filling in that state in 1970 yields a correlation coefficient of −0.33, which is significantly less than zero at the 0.01 level (one-tail test). Opinion data are from the American Dental Association, Bureau of Economic Research and Statistics, "Survey of Attitudes on Dental Licensing Procedures"; fee data are from the American Dental Association, Bureau of Economic Research and Statistics, "National Dental Fee Survey, 1970," *Journal of the American Dental Association*, vol. 83 (July 1971), pp. 57–69.

[4] American Dental Association, "New Licensure Policy," *Journal of the American Dental Association*, vol. 91 (December 1975), p. 1105. For background on the 1975 resolution and reviews of ADA licensure policy, see American Dental Association, Commission on Licensure, "1975 Annual Report," *Journal of the American Dental Association*, vol. 91 (September 1975), pp. 567–92; and American Dental Association, "Review of Licensure Policy," *Journal of the American Dental Association*, vol. 95 (July 1977), pp. 133–66.

but legislatures normally depend on the boards for advice in drawing and amending these acts.

The requirements for licensure vary from state to state. All states require graduation from a dental school approved by the state board. For admission to the practice of dentistry in a state, a graduate of an approved school must take a licensing examination unless he is licensed elsewhere and there is a reciprocity agreement between the states. Licensure examinations consist of two parts: a written examination and a practical or clinical examination.

In 1928 the National Board of Dental Examiners was formed to write standardized examinations on the theory and science of dentistry. By 1967 forty-four states recognized the certificate of the national board; by 1976 that number had increased to forty-eight. The content of the practical or clinical examination varies by state but typically includes a set of prescribed operative procedures (gold inlay, gold foil, or amalgam restoration), prosthetics (for example, complete upper denture to final try-in, including preparation of a laboratory prescription), crown and bridge work, oral diagnosis and treatment planning, and surgery. In some cases, portions of the clinical examination are written. In 1976 five states had oral or written examinations on dental ethics or on state laws pertaining to dentistry, twenty-one states required candidates for licensure to bring their own patients to the examination, and the fee for examination ranged from $25 to $150.[5]

Beginning in 1969, the dental boards of Maine, Maryland, Massachusetts, New Hampshire, New York, Pennsylvania, and West Virginia agreed to conduct a standardized clinical examination in five cities with members of each board forming the examination committees. There was tacit agreement that presentation of the regional test certificate for the clinical examination and the National Board of Dental Examiners certificate by a candidate would qualify him for licensure in one of the participating states.[6] By 1976 fourteen states accepted certificates on clinical examinations from the North East Regional Board, eleven states from the Central Regional Dental Testing Service, and three from the Southern Regional Testing Agency.[7] Wisconsin accepted

[5] American Dental Association, Bureau of Economic Research and Statistics, *Facts about States for the Dentist Seeking a Location, 1976* (Chicago: American Dental Association, 1976), pp. 10–18.

[6] New York and Washington, D.C., conducted simultaneous examinations as early as 1966. The concept of regional boards was endorsed by the ADA House of Delegates in 1968.

[7] American Dental Association, Bureau of Economic Research and Statistics, *Facts about States, 1976*, p. 13.

examination results from the North East Regional Board and the Central Regional Dental Testing Service.

There has been considerable criticism of state board practical examinations.[8] The most common complaints are that the examinations include material irrelevant to good dental practice and that, because the examinations are subjectively graded, they can be used as a tool to discriminate against out-of-state applicants. The instructions to dentists applying for an Indiana license illustrate the point that "quality" as perceived by a state board may have little to do with conventional notions of fitness to practice dentistry:

1. An applicant may be called upon to perform, write or discuss any aspect of dentistry at the discretion of the examiners, and
2. Any applicants will be disqualified if their general appearance, attitude and housekeeping do not satisfy the professional standards of the Board. Neatness, correct spelling, legibility of writing, and good English will be considered in grading the manuscripts.[9]

Failure rates of out-of-state graduates are often higher than those of in-state graduates, although this can be a misleading indicator of board bias, because out-of-state applicants may not have the same qualifications as in-state applicants. Students who fail their in-state examinations or believe they will fail are more likely to apply in more than one state to increase their probability of being licensed to practice dentistry somewhere, and in-state schools may teach special skills required on the examination. Of course, to the extent that these special skills are unrelated or only marginally related to good dental practice, their presence on the licensing examination constitutes a subtle form of restriction against entry from out-of-state. On the 1970 licensing examinations, the failure rates of 1970 graduates for all states combined were 4 percent for applicants from in-state schools and 18 percent for applicants from out-of-state schools; the failure rates for applicants who graduated before 1970 from in-state and out-of-state schools were 8 percent and 26

[8] See the statement by the National Council for Improvement of Dental Licensure in U.S. Congress, Senate, Committee on Labor and Welfare, Subcommittee on Health, *Hearings before the Subcommittee on Labor and Public Welfare*, 92nd Congress, 1st session, 1971, pt. 7, pp. 1721–23; Mark Doktor, "The Irrelevance of Licensing Examinations," *Journal of the American College of Dentistry*, vol. 40 (April 1973), pp. 100–107; and Lawrence E. Shepard, "Licensing Restrictions and the Cost of Dental Care," *Journal of Law and Economics*, vol. 21 (April 1978), pp. 187–201.

[9] J. E. Regan, "State Dental Board Examination Changed," *Journal of the Indiana Dental Association*, vol. 49 (April 1970), pp. 140–43.

percent, respectively.[10] In California the failure rates of 1970 graduates on the 1970 examinations were 7 percent for applicants from in-state schools and 59 percent for applicants from out-of-state schools;[11] the corresponding failure rates for 1973 graduates on the 1973 licensing examination were 12 percent and 63 percent, respectively.[12]

In 1967 forty states and the District of Columbia had statutory provisions for recognition, by reciprocity or endorsement, of dental licenses issued in other states.[13] Typically, however, several qualifications had to be met before reciprocity was granted—several years of continuous practice, possibly a clinical or practical examination, and usually an agreement of reciprocity between the states. In spite of the large number of states with statutory provisions for reciprocity, there are even now only a few states with even limited agreements. In 1969 only seventeen states reported some form of reciprocity agreement.[14] As an example of the restrictiveness of some of these agreements, New Hampshire recognized licenses only from Alaska, and Alaska only from New Hampshire. In 1976 twenty-one states plus the District of Columbia reported such agreements.[15]

In addition to licensing dentists and dental hygienists, the state boards establish and administer regulations covering the operation of dental practices—for example, determining the duties that can be performed by auxiliaries, establishing requirements for license renewal, and setting restrictions against the corporate practice of dentistry and advertising. Boards are also disciplinary agents for violations of their own regulations and of state dental practice acts.

It is clear that state licensing boards have considerable ability to limit entry of dentists into their jurisdictions by deciding whether to establish reciprocity agreements, by conducting rigorous qualifying examinations and setting high passing standards, and by otherwise raising application costs. What remains to be seen is whether state licensing boards have had a measurable impact on the distribution of dentists among states.

[10] Calculated from data given in American Dental Association, Council on Dental Education, *Dental Licensure Examinations, 1970* (Chicago: American Dental Association, 1970).

[11] Ibid.

[12] American Dental Association, Council on Dental Education, *Dental Licensure Examinations, 1973* (Chicago: American Dental Association, 1973).

[13] National Advisory Commission on Health Manpower, *Report*, p. 502.

[14] American Dental Association, Bureau of Economic Research and Statistics, *Facts about States for the Dentist Seeking a Location, 1969* (Chicago: American Dental Association, 1969), p. 19.

[15] American Dental Association, Bureau of Economic Research and Statistics, *Facts about States, 1976*, p. 19.

Empirical Tests of the Effects of Licensure on the Distribution of Dentists

Four important studies have attempted to measure the effects of the licensing of dentists on interstate markets for dental services: direct estimation of the influence of reciprocity on fees, dentists per capita, and net incomes of dentists by Lawrence Shepard; an analysis of licensure and the migration, location, and income of dentists and physicians by Lee Benham, Alex Maurizi, and Melvin Reder; a study of the migration of dentists by Alex Maurizi; and an article by Arlene Holen on the effects of professional licensing arrangements on interstate mobility of professionals (dentists, lawyers, and physicians).[16]

Shepard concluded that in 1970 the average price of services in states that had a reciprocity provision as part of their licensing regulations was nearly 15 percent lower than the average price of the same services in states without reciprocity.[17] As will be shown, however, the impact of reciprocity on prices implied by his econometric model of the dental care market is far smaller than he reports. The economic model consists of five equations:

(1) Dentists per capita = *f*(earnings, reciprocity, exogenous variables)
(2) Price = *f*(quantity of services demanded per capita, exogenous variables)
(3) Price = *f*(quantity of services supplied per capita, dentists per capita, reciprocity, exogenous variables)
(4) Earnings = *f*(dentists per capita, reciprocity, exogenous variables)
(5) Quantity demanded per capita = quantity supplied per capita

where *f* means "function of." The model is estimated by two-stage least-squares regression using states in 1970 as observations. In the estimated equations, reciprocity is positively related to dentists per capita and negatively to price and net earnings.[18]

[16] Lawrence E. Shepard, "Licensing Restrictions and the Cost of Dental Care," *Journal of Law and Economics*, vol. 21 (April 1978), pp. 187–201; Lee Benham, Alex R. Maurizi, and Melvin W. Reder, "Migration, Location and Remuneration of Medical Personnel," *Review of Economics and Statistics*, vol. 50 (August 1968), pp. 332–47; Alex R. Maurizi, *Economic Essays on the Dental Profession* (Iowa City: College of Business Administration, University of Iowa, 1969); and Arlene S. Holen, "Effects of Professional Licensing Arrangements on Interstate Labor Mobility and Resource Allocation," *Journal of Political Economy*, vol. 73 (October 1965), pp. 492–98.

[17] Shepard, "Licensing Restrictions," p. 199.

[18] Ibid., table 4, p. 198.

To calculate the impact of reciprocity on price, Shepard adds the direct effect of reciprocity on price in the supply of services in equation (3) to the indirect effect resulting from the influence of reciprocity on the number of dentists per capita in equation (1) multiplied by the effect of a change in the number of dentists per capita on price in equation (3). This calculation is incomplete, however, because reciprocity also affects the earnings of dentists—equation (4)—thereby altering the supply of practitioners. To take into account all the direct and indirect impacts of reciprocity, one must solve all five equations simultaneously for price as a function of reciprocity and other exogenous variables. In this price equation, reciprocity reduces the fee index by only $0.16, less than 10 percent of the $1.87 figure reported by Shepard.[19]

While Shepard's model implies a negligible impact of reciprocity on dental prices, there is some reason to doubt the model's validity. In particular, the specification of the net earnings equation is theoretically inappropriate. By definition, net earnings equal gross receipts minus costs, and gross receipts per practitioner equal price times quantity supplied per practitioner. Price and quantity supplied are determined in the demand and supply of services equations, but their values in these equations are not reflected in the earnings equation. In addition, no economic rationale is offered for including the reciprocity variable in the earnings equation. Since Shepard's econometric model of the dental care market appears to have some serious shortcomings, calculations based on it have little value.

The empirical work by Maurizi and by Benham and his colleagues is primarily descriptive. They use states as the units of observation and regress the number of dentists, dentists per capita, changes in dentists per capita, net migration, and dentists' mean net income on variables that might possibly be related to them. Their findings are generally difficult to interpret, because they do not attempt to provide structural models of the migration process and they rely on the overall failure rate on the state board examination as a measure of barriers to entry. Benham points out that the failure rate is only one indicator of a variety of ways in which licensing impedes mobility and that the overall failure rate does not distinguish between in-state and out-of-state applicants. In addition, it should be noted that the observed failure rate is an *ex post* measure; that is, the observed failure rate is the actual number of failed candidates divided by the actual number of applicants. We would expect that some dentists will be discouraged from applying for a license if their *ex ante* (or anticipated) probability of failure is high. The ob-

[19] Ibid., p. 199.

served failure rate will be lower than the *ex ante* probability of failure—which is the more valid measure of restrictiveness.[20]

Two findings from these studies are of some interest. First, migration between states and changes in the number of dentists per capita indicate that there is some spatial economic adjustment. In-migration rates and changes in the number of dentists per capita show positive associations with levels of, and changes in, state per capita incomes and population.[21] Furthermore, "the number of dentists per capita [has] tended relatively to increase in states where their average income was initially high, and relatively to decline in those where the initial number of dentists per capita was high."[22] Second, failure rates show a positive relationship with the level of dentists' net incomes, suggesting that dentists in high-income states may pursue more restrictive policies toward new entrants than dentists in low-income states and that there is persistent excess demand for entrance into states where dentists' incomes are relatively high.[23] The analyses performed by Maurizi and by Benham and his colleagues provide some support for the hypothesis that licensing has impeded the adjustment process.

Corroborative evidence of a different sort is provided in Holen's study. Holen compares licensing restrictions for three professions—medicine, law, and dentistry—and concludes that licensingregulations for lawyers and dentists are more restrictive than those for physicians, primarily because reciprocity is much more common for physicians.[24] She then employs two tests to see whether licensing inhibits mobility.

The first test compares "the ratios of members who moved to different states (from 1949 to 1950) to members who moved to different counties, both interstate and intrastate."[25] She suggests that when interstate mobility is restricted, as in the case of dentists and lawyers, the fraction of migrants who cross state lines should be smaller. From 1949 to 1950, physicians "had the highest ratio, 68 percent, while dentists and lawyers were both under 40 percent."[26] Table 1 updates the Holen test to the period 1965–1970. The within-state migration rates (column

[20] For a similar critique of the use of applications of bank charters to measure the restrictiveness of banking legislation, see Sam Peltzman, "Entry in Commercial Banking," *Journal of Law and Economics*, vol. 8 (October 1965), pp. 11–50.

[21] Benham, Maurizi, and Reder, "Migration, Location and Remuneration," table 2, p. 335; and Maurizi, *Economic Essays*, pp. 43–45.

[22] Benham, Maurizi, and Reder, "Migration, Location and Remuneration," p. 341.

[23] Ibid., table 4; and Maurizi, *Economic Essays*, p. 46.

[24] Holen, "Effects of Professional Licensing Arrangements." Holen notes that lawyers are expected to be less mobile, not only because of licensing restrictions but also because laws about which the lawyer must be knowledgeable vary from state to state.

[25] Ibid., p. 494.

[26] Ibid.

TABLE 1

MIGRATION BY OCCUPATION, 1965–1970
(males, age 25–64)

	(1) *Total*	(2) *Changed Counties*	(3) *Changed States*	(4) *Interstate Moves as a Proportion of All Moves* (3)/(2)	(5) *Instate Migration Rates* ([2]–[3])/(1)	*Interstate Migration Rates* (3)/(1)
Dentists						
25–44	40,949	12,622	6,683	0.529	0.145	0.163
45–64	35,588	1,881	544	0.289	0.038	0.015
Total	76,537	14,503	7,227	0.498	0.095	0.094
Physicians (including osteopaths)						
25–44	129,098	51,210	34,900	0.682	0.126	0.270
45–64	102,151	8,605	3,969	0.461	0.045	0.039
Total	231,249	59,815	38,869	0.650	0.091	0.168
Lawyers						
25–44	134,009	43,906	20,054	0.457	0.178	0.150
45–64	85,662	6,167	2,288	0.371	0.045	0.027
Total	219,671	50,073	22,342	0.446	0.126	0.102

SOURCE: U.S. Bureau of the Census, U.S. Census of Population: 1970 Subject Reports, *Mobility Status of Employed Males 25 to 64 Years Old by Selected Detailed Occupation: 1970*, Final Report PC(2)–2B (Washington, D.C.: U.S. Government Printing Office, 1973), table 7, pp. 39–48.

5) for dentists and physicians are similar, but the interstate migration rates (column 6) for dentists are much lower than those for physicians. The pattern of migration for 1965 to 1970 is similar to the pattern from 1949 to 1950; of those who changed counties, the fraction of dentists who also changed states (column 4) is lower than the fraction of physicians.[27] The difference is particularly marked in the older age group.[28] Lawyers are intermediate between the other two professions.

Holen's second test compares

> the internal dispersion of income with state-average professional incomes. Where interstate mobility is restricted we would expect to find higher dispersions of average state incomes than seem warranted by the internal dispersion. This is because adjustment to a change in demand for professional services within a state can be made most easily by either drawing professionals from other states or losing professionals to other states. Where this adjustment can take place only with difficulty, it is likely that at any given time differences in supply relative to demand will be pronounced among states. Such a misallocation of resources would be reflected in differences among average state professional incomes.[29]

As an empirical test of this hypothesis, she calculates for each profession the unweighted standard deviation of average state incomes and compares it to the standard deviation of income among all practitioners in the profession for a year near 1950.[30] The ratio of the standard deviation of average state incomes to the standard deviation of income within the profession is higher for dentists (0.26) and for lawyers and judges (0.18) than for physicians (0.13). While Holen did not have data on the number of respondents by state to test the statistical significance of the between-state dispersions, she concludes from her analysis that dentist and lawyer licensing laws were more restrictive than licensing laws pertaining to physicians.

Table 2 presents the results of an analysis of variance for dentists'

[27] Data from the U.S. Bureau of the Census 1/1000 public use tapes for the 1960 Census of Population yield similar results for migration from 1965 to 1970. Of 89 dentists, 20 percent changed counties, and only 3 percent changed states; of 219 physicians (including osteopaths), 22 percent changed counties, and 16 percent changed states; and of 224 lawyers and judges, 17 percent changed counties, and 7 percent changed states. See Jack Ladinsky, "The Geographic Mobility of Professional and Technical Manpower," *Journal of Human Resources*, vol. 2 (Fall 1967), pp. 475–94.

[28] In the younger age group, there is some migration associated with schooling and military service, since the migration measure refers to changes in location from 1965 to 1970 and persons in this age group could have moved at any age from twenty to forty-five.

[29] Holen, "Effects of Professional Licensing Arrangements," pp. 494, 496.

[30] Holen employs income data from the National Income Division survey of lawyers (1946 figures), dentists (1948 figures), and physicians (1949 figures).

TABLE 2

F-TESTS OF WITHIN- AND BETWEEN-STATE VARIANCE IN DENTISTS' NET INCOMES FOR VARIOUS YEARS[a]

	1952	*1955*	*1958*	*1961*	*1964*	*1967*	*1970*
Mean net[b] income	$10,574	$12,278	$14,255	$15,803	$19,269	$24,379	$30,035
U.S. standard deviation[b]	6,547	6,914	7,661	8,964	10,612	12,662	16,658
F	7.348	13.958	5.773	7.752	5.717	5.559	5.530
Degrees of freedom							
Numerator[c]	27	32	49	46	47	48	48
Denominator	3827	5640	4528	6539	5601	6733	7124

[a] The *F*-statistic is the ratio of the variance between states to the variance within states. In all cases, the calculated *F*-statistics are significant at the 0.005 level.

[b] The U.S. mean net incomes, U.S. standard deviations, and the standard deviations between states are calculated from the standard deviations and mean incomes reported for states in various ADA surveys. It is not possible to use the means and standard deviations of incomes for the United States reported in the surveys because they include observations from states other than those for which state data are reported. The ADA discards returns from overrepresented states in calculating the means and standard deviations. Data reported separately for each state include all usable returns from the state. The U.S. mean net incomes and standard deviations calculated from the state data reported by the ADA are quite close to the means and standard deviations for the United States as calculated by the ADA.

[c] For 1952, data include all dentists. For other years, they include only nonsalaried dentists. The District of Columbia is included as a state for all years but 1952.

incomes using Holen's basic approach. In all years, the between-state variance in incomes is statistically significantly larger than the within-state variance (with significance measured at the 0.005 level—that is, we can be 99.5 percent sure that the difference is significant).

There are several improvements that could be added to the Holen test. First, the hypothesis should be formulated in terms of prices of services, not in terms of practitioner incomes. In other words, we should expect that, the more effective licensure, the more will the between-state variation in fees exceed the within-state variation. Net income is an inappropriate measure because the levels and dispersion of net income depend on the distributions of dentists' preferences for income and leisure and their abilities to transform inputs (such as hours worked by the dentist, hours worked by auxiliaries, and capital) into services, as well as variations in the prices of inputs and services. Second, fees should be adjusted for variation among states resulting from differences in the age composition of dentists, costs of living, and input prices. No adjustment for fee variations among states resulting from differentials in the quality of dentists is necessary, because variation in service quality is a possible consequence of effective licensure.

Using 1968 American Dental Association survey data, which provide information on fees for more than 5,000 dentists, I have attempted to incorporate these improvements to Holen's procedure. To see whether the differences in fees among states are significantly different from those that would be expected as a result of variations among states in factors cited in the previous paragraph and as a result of the inherent stochastic (or random) variation in fees within the profession, I have regressed fees on variables expected to influence fees with or without licensing and a set of state dummy variables. A dummy variable for a state is a variable that equals 1 if the dentist practices in that state and 0 if he does not. A test for whether fees differ among states after adjustment for variables expected to influence fees with or without licensure is whether the coefficients of the state dummy variables are significantly different from zero.[31]

Table 3 shows regressions of the comprehensive fee and net income of nonsalaried general practitioners on the age of the dentist (and the square of age), the wage rate of assistants (deflated by a state cost-of-living indicator), a set of variables for the size of community in which the dentist practices, and the state dummy variables. Both dependent

[31] This procedure for estimating whether fees differ among states after adjustment for variations in variables expected to influence fees with or without licensing is equivalent to analysis of covariance; see Jack Johnston, *Econometric Methods*, 2d ed. (New York: McGraw-Hill, 1972), pp. 192–207.

TABLE 3

EXPLANATION OF FEE AND NET INCOME VARIATIONS

Variable	*Comprehensive Fee*		*Net Income*	
	Coefficient	*t*	Coefficient	*t*
Constant (Washington, city size 100,000 to 1 million)	12.30		−25.65	
Age	0.09	0.46	18.97	20.48
Age²	−0.03	1.33	−2.13	22.06
Wage	0.04	8.89	0.24	10.87
City size				
Under 2,500	−2.36	19.26	−2.92	5.25
2,500–25,000	−1.46	18.43	−0.96	2.68
25,000–100,000	−0.56	6.65	0.18	0.48
Over 1 million	0.30	1.99	−1.21	1.83
Alabama	−2.85	5.82	3.42	2.44
Arizona	−0.68	2.26	−0.41	0.32
Arkansas	−1.31	4.23	1.82	1.37
California	1.51	5.83	3.11	2.95
Colorado	−0.51	1.81	−0.31	0.26
Connecticut	−1.57	5.51	0.87	0.72
Delaware	−0.51	1.67	−1.84	0.53
Florida	0.20	0.70	4.22	3.45
Georgia	−0.96	3.24	9.66	7.66
Hawaii	−1.95	5.08	−1.61	1.01
Idaho	−0.96	2.67	−1.45	0.96
Illinois	−0.96	3.48	1.84	1.58
Indiana	−1.39	4.52	2.90	2.22
Iowa	−0.96	3.27	2.60	2.07
Kansas	−0.43	1.53	2.99	2.56
Kentucky	−1.72	5.62	2.60	1.95
Louisiana	−0.20	0.67	3.32	2.60
Maine	−3.14	9.10	0.13	0.09
Maryland	−0.56	1.89	3.19	2.58
Massachusetts	−1.51	5.15	−1.27	0.95
Michigan	−0.78	2.80	2.54	2.20
Minnesota	−0.74	2.60	2.42	2.04
Mississippi	−1.24	3.67	0.64	0.45
Missouri	−1.16	3.83	2.83	2.21
Montana	−0.56	1.55	−1.87	1.28
Nebraska	−0.13	0.48	2.01	1.69
Nevada	0.50	1.21	2.34	1.29
New Hampshire	−1.08	2.86	1.06	0.64
New Jersey	0.33	1.12	0.23	0.18

TABLE 3 (continued)

Variable	*Comprehensive Fee* Coefficient	*t*	*Net Income* Coefficient	*t*
New Mexico	−0.14	0.36	4.24	2.67
New York	−0.86	3.31	1.61	1.50
North Carolina	−1.14	4.00	6.12	5.16
North Dakota	0.07	0.19	4.57	2.77
Ohio	−1.65	5.97	1.09	0.93
Oklahoma	−0.36	1.27	0.79	0.66
Oregon	−0.50	1.67	−1.22	0.99
Pennsylvania	−1.74	5.98	1.35	1.10
Rhode Island	−2.02	3.52	−3.28	2.06
South Carolina	−1.51	4.66	3.65	2.61
South Dakota	−0.25	0.69	2.83	1.77
Tennessee	−1.87	5.81	2.00	2.14
Texas	0.40	1.35	0.36	0.28
Utah	−2.02	6.91	−3.59	2.79
Vermont	−1.49	0.99	2.39	1.34
Virginia	−0.93	3.27	2.94	2.45
West Virginia	−1.23	3.73	3.18	2.20
Wisconsin	−0.70	2.28	1.39	1.08
Wyoming	0.02	0.05	1.50	0.90
	R^2 = 0.28		R^2 = 0.41	
	F = 37.24		F = 21.63	
	n = 5115		n = 5,877	
	Mean value of comprehensive fee = $12.00		Mean value of net income (in $1,000) = 23.25	

variables are deflated by a state cost-of-living indicator.[32] The comprehensive fee is calculated as a weighted average (the weights in parentheses) of the usual fees for a dental prophylaxis (0.16), amalgam filling for a two-surface cavity (0.48), single extraction (uncomplicated with

[32] The cost-of-living indicator used to deflate nominal variables is based on the annual cost of a moderate living standard for a four-person family in the spring of 1967 given in U.S. Department of Labor, Bureau of Labor Statistics, *Handbook of Labor Statistics, 1969* (Washington, D.C., 1969), p. 339. The index for a state is a weighted average of the cost of living of metropolitan areas included in the Bureau of Labor Statistics sample, the regional cost of living for nonmetropolitan areas, and an estimate of the cost of living for metropolitan areas not included in the Bureau of Labor Statistics sample (obtained by multiplying the regional cost of living for nonmetropolitan areas by the ratio of the national metropolitan index to the national nonmetropolitan index). The weights are the proportions of a state's population living in the respective areas in 1970.

local anesthesia—0.32), acrylic jacket crown (0.02), and complete upper acrylic base denture (0.02). The weights reflect approximately the average composition of dentists' output.

The dentist's age was included in the regressions for several reasons. First, skill may vary systematically with age. Younger dentists, because of more recent training, may be more skillful than older dentists, or older dentists may be more skillful because they have acquired skills with experience—or both, in which case there will be no systematic variation with age. Second, age is likely to be a good proxy for length of practice in a community (assuming lack of mobility). If dentists who have been established for a long time in a community have demand curves for their services that differ from those of recently established practitioners, we would want to take that into account in our analysis. In the net income equation, the age variable may also capture some of the age variations in preferences for income or leisure. Because age-income profiles often resemble an inverted U, the square of the dentist's age is also included in the regressions. In the fee regression, the coefficients of the age terms are not statistically significantly different from zero at conventional levels of significance. In the net income regression, both coefficients are statistically significantly different from zero at the 0.01 level (that is, we can be 99 percent sure that the coefficients do not equal zero). Net income peaks at age forty-five.

The wage rate of full-time dental assistants is included to adjust for differences in factor prices and variations in the ratio of local to state costs of living.[33] The higher the prices of inputs, *ceteris paribus*, the higher will be the equilibrium fee. The higher the cost of living, *ceteris paribus*, the higher will be the fee. As expected, the wage coefficient is positive and is statistically significantly greater than zero at the 0.05 level in both regressions (that is, we can be 95 percent sure that the wage coefficients exceed zero).

The regressions also include a set of dummy variables for the size of community in which the dentist practices. In the regression analysis, a community size variable is set equal to 1 if the dentist practices in a community of that size and 0 if he does not. These variables are included to take into account cost-of-living differences by city size and compensating differences for the amenities or disamenities of various sizes of communities. In the comprehensive fee regressions, the coefficients of the city size variables are all statistically significantly different from zero at the 0.05 level: they show that prices increase with city size. Coeffi-

[33] When no assistant was employed by the dentist, the assistant's wage used in the regression was the average for full-time assistants in the state in which the dentist practiced.

cients of the city size in the income equation show increases in net income up to city size of 100,000 and decreases thereafter.

The estimated coefficients on the state dummy variables are not particularly relevant to this analysis. They do provide fee differences between states adjusted for the values of other variables included in the regression, and these are preferable to unadjusted differences, such as those employed by Benham and his colleagues in their descriptive analysis. The difference between the highest and lowest adjusted fees is quite large; the adjusted fee in California exceeds the adjusted fee in Maine by $4.65, where this difference is obtained by subtracting the coefficient of the dummy variable for Maine from the coefficient of the dummy variable for California.

The test for whether fees (or net incomes) differ among states after adjustment for variations among dentists in the values of variables expected to influence fees (or incomes) with or without licensure is whether the set of coefficients on the state dummy variables is significantly different from zero. Statistical tests show that the sets of state dummy variables in both the comprehensive fee and the net income regressions are significantly different from zero at the 0.01 level.[34]

As a test of licensure's effect on mobility, the procedure used here is not without shortcomings. First, other factor prices besides the wage rate of aides may vary among states or regions.[35] Failure to adjust for variations in these prices could explain the significance of the state dummy variables. Second, the test only confirms that there are differences in fees between states not accounted for by the variables held constant.[36] It does not tell whether differences have arisen from reduced

[34] The *F*-statistic for the test of the hypothesis that the set of coefficients of the state dummy variables in the comprehensive fee regression equals zero is 17.36 with 48 degrees of freedom in the numerator and 5,538 degrees of freedom in the denominator; the corresponding *F*-statistic for the net income regression is 5.71 with 48 degrees of freedom in the numerator and 6,388 degrees of freedom in the denominator. Both *F*-statistics are statistically significant at the 0.01 level, so that we can be 99 percent sure that fees differ among states even after adjustment for variations among dentists in the other variables included in the regressions. Results similar to that for the comprehensive fee are obtained when the extraction fee and the fee for a two-surface amalgam are used as the dependent variables in the regression analysis.

[35] E. Bruce Fredrikson shows, for example, that there are distinct regional differences in residential mortgage yields and explores imperfections in capital markets that give rise to geographic differences in the cost of capital; see E. Bruce Fredrikson, "The Geographical Structure of Residential Mortgage Yields," in Jack M. Guttentag, ed., *Essays on Interest Rates* (New York: National Bureau of Economic Research, 1971), vol. 2, pp. 187–280.

[36] In their discussion of the paper, George Hay and Donald House suggest alternative explanations for the observed geographical variation in prices. Dr. Hay argues that price and income differences among states may merely reflect compensation for the amenities

mobility due to licensure or from other factors contributing to low mobility. A similar analysis of data on physicians or of data on a profession without licensing would provide a standard against which these results could be compared. Unfortunately, no such data are available to the author at this time. When the results of the regression analysis are combined with the migration data of table 1 and the findings of Benham and his colleagues and Maurizi, however, there is a strong suggestion that licensing has inhibited the mobility of dentists and affected their geographical distribution.

The Effects of Licensure Reform

A consequence of restricted mobility is that dental fees are higher and output lower in some states than would otherwise be the case. On the other hand, fees are lower and output larger in states from which dentists would migrate if there were no restrictions, so that the net impact of unrestricted mobility on the price and quantity of services supplied and consumed is an open—and thus empirical—question. This section of the chapter attempts a rough estimate of the effects of nationwide reciprocity or unrestricted mobility on prices and quantities. The procedure for making this estimate involves estimating demand and supply curves for dental services and then reallocating dentists among states until prices are equal in all locations, where the equilibrium price in a state is determined by equating quantities of services supplied and demanded (given the number of dentists and the values of variables influencing demand).

Table 4 presents estimates of constant elasticity demand and supply

or disamenities associated with living in those states. To the extent, however, that dentists and their assistants share similar preferences and to the extent that cost-of-living differences incorporate the higher rents of preferred locations, the regression analysis of table 3 (which adjusts fees for assistants' wages and costs of living) should partially control for location-specific amenities. More persuasive evidence that observed price differences reflect more than simple compensation for amenities or disamenities is that the number of out-of-state applicants to a state in 1970 is positively correlated with the adjusted fee differences among states calculated from the comprehensive fee equation given in table 3 ($r = 0.50$).

Dr. House notes that the full price of a dental service is the sum of its money price and the value of time of the patient spent consuming the service. In locations in which the opportunity costs of patients' time are higher, we would expect dentists to devote resources to reducing waiting and treatment time and to charge higher fees. Thus it would be possible to have equal full prices in all locations but still to have variation in money prices. While it is theoretically possible for differences in the opportunity costs of time of consumers among states to explain the fee differences shown in table 3, it is not a complete explanation, since the hypothesis would imply further that net incomes of dentists would be equal in all locations, holding constant cost of living, factor prices, and age of dentist. The net income regression in table 3 does not support this hypothesis.

TABLE 4

TWO-STAGE LEAST-SQUARES ESTIMATION OF THE DEMAND AND SUPPLY FOR DENTAL SERVICES, 1967,
(all variables in natural logarithms and standard errors in parentheses)

Quantity demanded
$= 3.5786 - 1.8687\ FEE + 2.2262\ YCAP - 0.2389\ FLUOR + 1.0000\ POP$
$\quad\quad (0.3573) \quad\quad (0.3021) \quad\quad (0.0697)$

Quantity Supplied
$= 8.91227 - 0.2809\ FEE + 0.9959\ DENTISTS$
$\quad\quad (0.0733) \quad\quad (0.0119)$

NOTE: Quantity demanded and Quantity supplied are the number of patient visits; *FEE* is average price per patient visit measured in dollars; *YCAP* is per capita income in $1,000; *POP* is population; *DENTISTS* is the number of active nonfederal dentists; and *FLUOR* is the percentage of a state's population served by fluoridated water. Average price per patient visit and income per capita are deflated by state cost-of-living indicators. Observations are weighted by the population of the state. The coefficient of *POP* is constrained to equal 1.0. Alaska, Delaware, and the District of Columbia are excluded from the regressions.

functions for dental services.[37] Quantity supplied is a function of the price of dental services and the number of active dentists; quantity demanded per capita is a function of the price of dental services, per capita income, and the fraction of the state's population served with fluoridated water. (In table 4 both sides of the demand equation are multiplied by population to obtain aggregate quantity demanded.) Price and income per capita are deflated by state cost-of-living indicators. The equations are estimated by two-stage least-squares with states as the units of observation, each observation being weighted by the population of the state.[38] Output in each state is measured as the average number of patient visits to active nonsalaried solo practitioners times the number of active dentists. Since gross income is the sum of price-weighted patient visits (neglecting uncollected charges), the average price per patient visit is calculated by dividing mean gross income of nonsalaried dentists by the average number of patient visits. Visits are heterogeneous units. The price calculated here represents the average price paid by consumers and the average price received by dentist per heterogeneous unit. An advantage of this procedure is that price times quantity yields total expenditure by consumers and gross receipts of dentists, thereby permitting estimation of the effects of the redistribution of dentists on consumer expenditures and on dentists' gross revenue and mean gross income. Other alternatives are (1) using the average price of a standard service (for example, two-sided amalgam filling or the comprehensive fee) with the number of visits as calculated above or (2) using the average price of a standard service and deflating gross income by price to obtain a measure of output. Estimates of the equations with these alternatives are less plausible than those reported in table 4. For example, when the comprehensive fee is used as the price variable and patient visits as the quantity variable, the estimated demand curve is price inelastic, and the coefficient of the fluoridation variable is positive, though not statistically significantly different from zero. The price elasticity of demand and the fluoridation coefficient are inconsistent with previous estimates of these parameters discussed below. The estimated price elasticity of supply is even more negative than the one reported in table 4.

The estimated coefficients of the demand and supply equations in table 4 indicate that demand is price elastic, that the income elasticity of demand is greater than one, that fluoridation reduces the demand for dental services, that the supply curve is backward bending, and that a 1 percent increase in the stock of dentists, holding price constant, increases quantity supplied by approximately 1 percent. These findings are generally consistent with other studies using different data. Feldstein reviews previous research on the influence of income and fluoridation on demand.[39] All studies reviewed by Feldstein conclude that the income elasticity of demand exceeds one and that fluoridation reduces demand. Previous estimates of the price elasticity of demand are ordinarily somewhat smaller (in absolute value) than that reported in table 4; estimates of the price elasticity of supply are usually close to zero and are sometimes negative.[40] In a model similar to the one presented in table 4 but using regional mean values from seven ADA surveys conducted between 1955 and 1967, Feldstein estimates a price elasticity of demand of -1.43

[37] A discussion of the estimation of supply and demand functions for the services of independent practitioners can be found in Jack W. Wilson and Bryan L. Boulier, "A Model for Reconciliation of Estimates of the Market Demand and Supply of Services of Dentists and Physicians" (unpublished manuscript, 1978).

[38] Alaska, Delaware, and the District of Columbia are excluded because of lack of data.

[39] Paul J. Feldstein, *Financing Dental Care: An Economic Analysis* (Lexington, Mass.: Lexington Books, 1973).

[40] Although this result is consistent with other studies, it is perhaps surprising that the supply curve is negatively sloped. An explanation is that dentists maximize utility rather than profit and that an increase in the price of output has both substitution and income effects; see Uwe Reinhardt, "A Production Function for Physician Services," *Review of Economics and Statistics*, vol. 54 (February 1972), pp. 55–66; and Bryan L. Boulier, "Supply Decisions of Self-Employed Professionals: The Case of Dentists," *Southern* Economic Journal, vol. 45 (January 1979), pp. 892–902. On the one hand, a higher price raises remuneration per hour worked and induces a dentist to substitute work for leisure and to employ additional inputs resulting in increased output. On the other hand, a higher price raises the dentist's income for any given level of output and leads to an increase in the consumption of leisure if leisure is a normal good. The net effect is indeterminate a priori. Because of licensing restrictions that limit interstate migration of dentists, the estimated supply equation represents the net impact of an increase in price on the supply of output of a fixed stock of dentists.

and a positive price elasticity of supply of 0.29.[41] In a replication of Feldstein's work but including two additional surveys, deflating dental prices and income per capita by the consumer price index, and including dummy variables for the survey years in the supply equations, Jack Wilson and I estimated a price elasticity of demand of −1.40 and a price elasticity of supply of −0.32, although the estimated price elasticity of supply was not statistically significant from zero.[42] Estimates of the price elasticity of supply using individual data also indicate a backward-bending supply curve. If it is assumed that the prices of output and inputs for an individual dentist are exogenous, a regression of output on fee and input prices yields an identified supply curve, which can be estimated by ordinary least-squares. Using data from the 1968 ADA survey, I have estimated a price elasticity of supply of −0.23 when the logarithm of output is regressed on the logarithm of the extraction fee and an elasticity of −0.32 (evaluated at the means) when output is regressed on the extraction fee and its square.[43] The consequences of assuming a zero price elasticity of supply or a lower price elasticity of demand are discussed below.

To simulate the effects of nationwide reciprocity, dentists are distributed among states until the real price of services is equalized in all locations, where the price in each state is determined by the estimated supply and demand equations, by state data on real per capita income and the extent of fluoridation, and by the number of dentists allocated to the state. Before the results of the simulation are summarized, a word of caution is in order: because migration costs are not incorporated in the simulation, the actual redistribution of dentists in the short run would be less than what is estimated.

The aggregate effects of the estimated redistribution are relatively small. The average price per visit increases by about 1 percent, from $13.14 (calculated by weighting the average real price in each state by

[41] Feldstein, *Financing Dental Care*, p. 144.

[42] Wilson and Boulier, "A Model for Reconciliation of Estimates."

[43] See Boulier, "Supply Decisions of Self-Employed Professionals." Alex Maurizi, using a combination of state data and individual data from the 1962 American Dental Association Survey of Dental Practices, estimates a supply equation with a price elasticity of supply of 0.20; see Alex Maurizi, *Public Policy and the Dental Care Market* (Washington, D.C.: American Enterprise Institute, 1975). (On p. 25 he reports a price elasticity of supply of 0.79, but this value does not correspond to the estimate of 0.20 implicit in the reported supply equation on p. 62.) His supply equation, which includes price, capital, the number of auxiliary workers, and hours worked by the dentist as independent variables, is incorrectly specified, since all of these variables except price are endogenous variables. That is, these variables are not truly independent, since their values are chosen by the dentist at the same time he chooses the level of output to produce. A consequence of including these endogenous variables in the supply equation is that the estimate of the price coefficient is biased.

the number of visits) to $13.29. The number of visits decreases by 223,000, less than 0.1 percent. The mean gross income of dentists and aggregate receipts of dentists increase by slightly less than 1 percent.[44]

That the effect of redistribution is to raise the average price of services and to reduce output is not altogether surprising. Consider the simple case in which all states are identical (that is, by our definition have the same population, per capita income, and extent of fluoridation). Clearly, the outcome of nationwide reciprocity would be an equal number of dentists (and dentists per capita) in each state. Less obvious is the result that the average price of services would be maximized with an equal distribution of dentists among states. While a mathematical proof is necessary for the case in which the price elasticity of supply does not equal zero, the argument is straightforward if it is assumed that output per dentist is fixed. With a fixed stock of dentists, total output is constant (that is, it does not depend on the geographical distribution of dentists), and maximizing total expenditure is equivalent to maximizing average price per visit. A necessary condition for maximizing total expenditure is that the marginal expenditure generated by an additional dentist be equal in all states. Since in this example demand curves are the same in each state, marginal expenditure is equal in all locations when the number of dentists is the same in each state.

While the aggregate effects of nationwide reciprocity are small, there is considerable redistribution of dentists. Table 5 shows the estimated percentage change in the number of dentists by state. Of the forty-eight states included (excluding Alaska and Delaware), eighteen gain dentists, and thirty lose dentists. The estimated impacts of nationwide reciprocity on states such as California and West Virginia are quite large.[45] In California, the number of dentists increases 34 percent, output increases 41 percent, average price per visit falls 16 percent, and mean gross income of dentists decreases 12 percent. In West Virginia, the number of dentists decreases 35 percent, output falls 39 percent, the average price per visit rises 25 percent, and mean gross income of dentists increases 21 percent.

[44] In 1967 mean gross income was $45,284, total expenditure was $4.10 billion, and the number of visits was 311,889,664; in the simulation, mean gross income was $46,129, total expenditure was $4.14 billion, and the number of visits was 311,666,944.

[45] The figures presented for California and West Virginia compare conditions after redistribution with the initial equilibrium values of price, quantity, and gross income estimated from the supply and demand equations, the values of per capita income and fluoridation for each state, and the initial number of dentists. If actual values of price and gross income were used in the comparison, the percentage decreases in price and gross income in California would be somewhat larger than reported in the text, and the percentage increases in these variables in West Virginia would be smaller than reported. It should be remembered that the actual values of these variables are based on rather small samples in some cases and are subject to measurement error.

TABLE 5

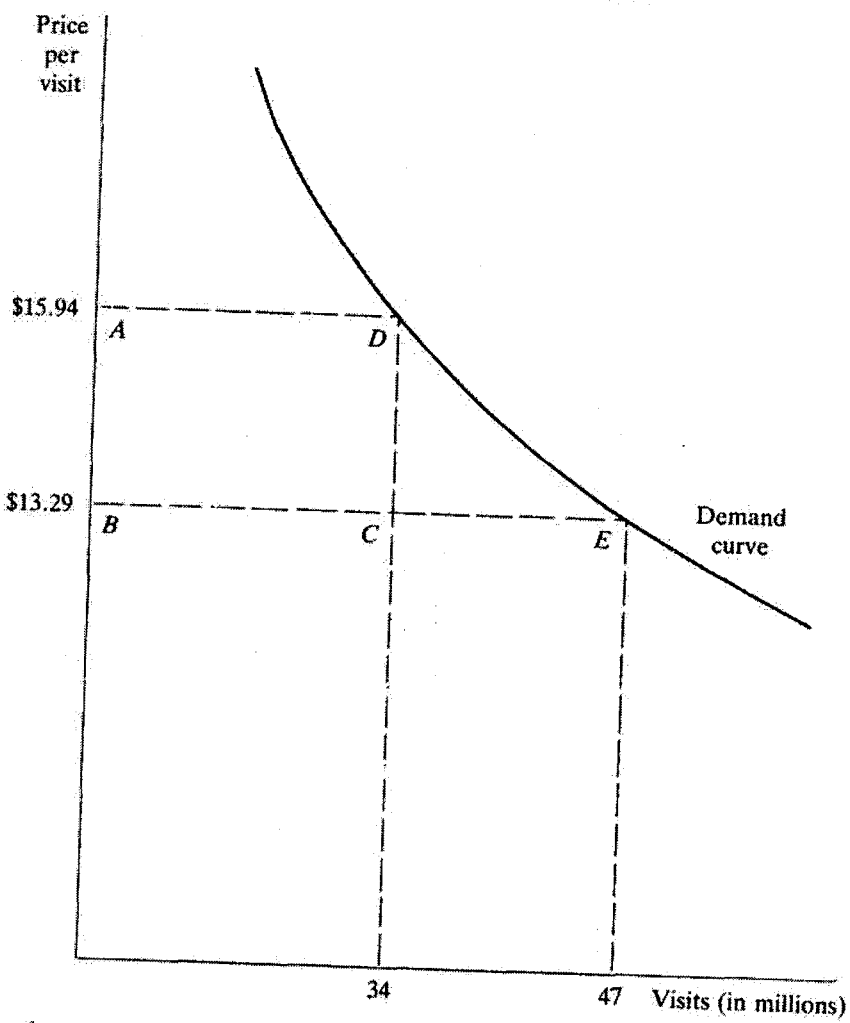
PERCENTAGE CHANGE IN THE NUMBER OF DENTISTS BY STATE ASSUMING NATIONWIDE RECIPROCITY, 1967

Percentage Change	*States*
Increase	
0–4	Florida, Michigan
5–9	Illinois, Ohio, Wyoming
10–14	Indiana, Massachusetts, North Carolina, South Carolina, Texas
15–19	Georgia, Kansas, Maryland
20–24	
25+	California, Louisiana, Nevada, New Hampshire, New Jersey
Decrease	
0–4	Missouri
5–9	Connecticut, Oklahoma, Pennsylvania, Utah, Vermont, Virginia
10–14	Alabama, Arizona, Iowa, Kentucky, Mississippi, Montana, New Mexico, South Dakota
15–19	Idaho, Maine, Nebraska
20–24	Hawaii, New York, Tennessee
25+	Arkansas, Colorado, Minnesota, North Dakota, Oregon, Rhode Island, Washington, West Virginia, Wisconsin

NOTE: Alaska, Delaware, and the District of Columbia are excluded because of inadequate data.

Given that nationwide reciprocity would lead to considerable redistribution of dentists, an increase in average price per visit, and a decrease in quantity of services produced, an important question is whether welfare increases or decreases. To measure the consequences for consumers, the estimated supply and demand curves were used to calculate the change in consumers' surplus resulting from the redistribution of dentists. The procedure for calculating the change in consumers' surplus is illustrated in figure 1 (for California). Before redistribution, the average price per visit is $15.94, and 34 million visits are consumed; after redistribution, the average price per visit is $13.29, and 47 million visits are consumed. The welfare gain (or increase in consumers' surplus) for Californians consists of the monetary saving of approximately $90 million on the initial 34 million visits consumed (the difference in price times 34 million visits, or the area *ABCD* in the figure) plus approximately 16 million dollars (the area *CED* in the figure), which is the difference between what consumers would have been willing to pay for the additional 13 million visits and the amount they have to pay. Of course, consumers in states from which dentists

FIGURE 1
WELFARE GAINS TO CALIFORNIANS FROM NATIONWIDE RECIPROCITY



migrate lose consumers' surplus. The net increase in consumers' surplus for all states combined is slightly less than $28 million in 1967 prices ($52 million in 1978 prices). Hence, consumers would be better off as a result of the reallocation of dentists.

While it is impossible to calculate the change in producers' surplus, because we have only the backward-bending portion of the supply

curve,[46] it is reasonable to conclude that dentists are also potentially better off, because aggregate receipts of dentists increase as a result of the redistribution. As total quantity produced diminishes, the aggregate net income of practitioners must increase by an even larger amount than the increase in aggregate receipts.

These results depend, of course, on the estimated parameters of the supply and demand curves. Nearly identical results are obtained if it is assumed that the demand curve is the same as the one used in the preceding simulation but that the supply curve of services is perfectly price inelastic and a 1 percent increase in the number of dentists raises output supplied by 1 percent.[47] If it is assumed that the price elasticity of demand is smaller (in absolute value) than -1.87, both the extent of the redistribution of dentists with reciprocity and the net gain in consumers' surplus would be smaller than estimated above. With a less-elastic demand curve, the number of dentists who would need to leave or to enter a state to bring the state's fee to the national average would be smaller, since a given change in the stock of dentists would induce a larger change in fee.

The net increase in consumers' surplus would also be smaller, since a given decrease in price would increase consumers' surplus by a smaller amount in states that gain dentists and a given increase in price would decrease consumers' surplus by a larger amount in states that lose them.

Conclusion

This paper has demonstrated that the present dental licensing system limits the mobility of dentists and has affected their geographical distribution. A simulation analysis has shown that removing licensing constraints on mobility of dentists through nationwide reciprocity would have little effect on the average price of dental services or the aggregate quantity of services produced and consumed but would result in a significant geographical redistribution of dentists and dental services as

[46] For a discussion of the calculation of producers' surplus for backward-bending supply curves, see R. Albert Berry, "A Review of Problems in the Interpretation of Producers' Surplus." *Southern Economic Journal*, vol. 39 (July 1972), pp. 93–106.

[47] When the number of visits per practitioner is held constant at the national average and dentists are redistributed among states until prices are equal in all locations, price per visit increases by approximately 1 percent to $13.29; mean gross income and total expenditure increase by a similar percentage. To the nearest million dollars, the net increase in consumers' surplus is identical with that derived from the equations reported in table 4 ($28 million).

well as increases in consumer surplus and in mean net incomes of dentists. Gains to dentists from reduction in costs of applying for licensure in new locations and nonmonetary gains to dentists from changing locations have not been measured.

Introduction

Simon Rottenberg

Occupational licensure can be approached within a framework of basic economics. The people of every country produce and consume diverse commodities and services. This mixed bag—the economy's output—is produced by combining the services of labor with other factors of production. These services of labor appear in varied forms; some involve more—and some less—energy, skill, intellect, and risk. The different tasks that are performed by those who render labor services and the different properties of those tasks are many and varied. People specialize in rendering labor services; each person who works performs a set of tasks that constitutes a very small portion of all the tasks done by all the people of the community. Since there is specialization of labor but less specialization in consumption, exchange occurs. Each person exchanges part of the product of his or her own specialized services for the products of others who also are specialized in the services they offer.

Invention, innovation, discovery, resource exhaustion, changes in the age composition of the population, and other such phenomena cause the composite set of tasks carried out by a country's people to be changed over time in sum and in the way they are arranged. That is to say, these variables affect the way in which all tasks are subdivided into subsets of tasks performed by an individual specialized worker. At any given time, however, some structure of task distribution occurs in society, and we have adopted the convention of calling each small set of tasks done by a homogeneous class of workers an occupation. The actual number of such occupations in any country will depend on the degree of diversity of the output of the country and on the degree of specialization in work.

In the United States, most occupations can be freely entered. An individual desiring to enter need only invest in acquiring the skills necessary to perform the tasks of the occupation, offer his services in the market at the market price, and diffuse information among prospective purchasers that his services are available on those terms. When exchange occurs, it is consensual. Both sellers and buyers of the proffered services

are unconstrained; neither is compelled to transact or to refrain from transacting. Since exchange, when it occurs, is consensual, both sellers and buyers are made better off for having made the exchange.

Some occupations are, however, licensed. In those cases, entry into an occupation cannot occur except with the permission of the state, and sellers and buyers cannot transact an exchange of the relevant services of the occupation unless the state has given its permission. There are said to be some eight hundred occupations licensed by at least one state in the United States. They include some learned professions (medicine and the law, for example) and some occupations requiring less time to learn (such as barbering) that are licensed in all states and other occupations that are licensed in only a smaller number of states. Some, indeed, are licensed in only a single state. Walter Gellhorn has reported that "in many parts of this country today aspiring bee keepers, embalmers, lightning rod salesmen, septic tank cleaners, taxidermists, and tree surgeons must obtain official approval before seeking the public's patronage."[1] To this list one might add tattooers, tourist guides, rainmakers, horse hunters, transporters of horses, cotton classers, threshers, textbook salesmen, and cosmeticians, all of which are licensed occupations in at least one state. Moreover, in addition to occupational licensing by states, some occupations require licenses issued by the federal government, and others require licenses issued by municipal authorities. The freedom of entry into occupations is additionally diminished indirectly by the licensing of businesses (interstate trucking), activities (the grazing of livestock on public lands, the storage of acids), and physical assets (air pollution control equipment, aircraft engines).

Occupational licensing appears in state statutes in three forms. In the strongest and most authentic form, the statutes define the tasks and functions of the occupation, prescribe that these tasks and functions may not be legally performed except by those upon whom the state has conferred a license, and describe the procedures for the acquisition of a license—which are, usually, the passing of an examination by those who are qualified by statute to be admitted to the examination and who petition for the right to be examined. In a weaker form, the statutes permit any person to offer his services in an occupation and permit the tasks of the occupation to be done by anyone, but they prescribe that only those who have qualified by examination may use the title of the occupation when services are offered to the public. These are sometimes called "title-protection" statutes. In a still weaker form, the statutes permit any person to offer services and to perform the relevant tasks,

[1] Walter Gellhorn, "The Abuse of Occupational Licensing," *University of Chicago Law Review*, vol. 44, no. 1 (Fall 1976), p. 6.

but the state administers an examination periodically and certifies those who have passed. This is sometimes called "certification."

Of greatest interest here are the implications of the strongest of these forms because it is in that form that occupational licensing is an instrument of public policy by which the state most clearly constrains entry into the licensed occupations. These strong occupational licensing statutes provide that only licensed persons may practice the relevant profession or trade and that, to secure a license, applicants must usually fulfill criteria of schooling, experience, and examination of competence. The licensing statutes generally define the behavior or the activities that only licensed persons may engage in. Persons not licensed may not legally engage in these activities. Thus, licensed persons "monopolize" the statutorily prescribed activities. Sometimes these defined activities encompass a broad area of tasks and cover many important activities; sometimes the definition of those activities that may by undertaken only by licensed persons is narrow, encompassing only few and trivial tasks.

Given the strength of the constraints on entry into the occupations imposed by licensing requirements regarding schooling, experience, and examination, the monopoly effects of a licensing statute will be powerful or weak, depending on the breadth or narrowness of the activities that may be legally performed only by licensed persons.

Licensing imposes higher costs of entry into the occupation than would exist if the occupation were not licensed. The stronger the constraints on entry and the more restrictive the requirements for procuring a license, the larger are the incremental costs of entry into the occupation imposed by licensing. If entry costs into an occupation are raised, the quantity of services produced in that occupation will diminish, and the price of the services will rise. The size of these output and price effects will depend on how good the available substitutes are. The more imperfect the substitutes, the larger will be the effect on prices and the smaller the effect on output; conversely, of course, the better the substitutes for the services of the licensed occupation, the smaller will be the effect on price and the larger the effect on output.

Entry costs imposed by licensing may be considered an entry fee paid by new entrants to the occupation to buy the right to acquire income in the practice of the licensed trade. Or they may be considered a tax on entry into the occupation. In the end, after market adjustments have had time to work themselves out, the incremental licensing costs of entry will really be borne jointly by buyers and sellers of the relevant services. The more imperfect the substitutes for the services produced in the licensed occupation, the larger the fraction of the incremental costs borne by buyers.

Sometimes the effects of an increase in the entry costs for new

entrants can be achieved without additional legislation by the exercise of discretion by license examining boards. Examining boards are almost invariably heavily composed of incumbent practitioners in the relevant profession—the nominal defense for which is that practitioners are most knowledgeable about the profession. Practitioners on examining boards can, however, administer the licensing law in ways that advance their interests at the expense of others (such as consumers of the services of the relevant profession, those who aspire to enter the profession, or employers of those in the relevant profession). Thus examining boards can strengthen constraints on entry into licensed occupations by manipulating the examination pass rates. If the boards desire to reduce the number of new entrants at any time, they can raise the standards for passing the examination. Thus they will achieve the same purpose as an amendment to the licensing law imposing stronger constraints on entry (more schooling, or experience, or a higher age to qualify for taking the licensing examination).

For a given licensed occupation, there will be variance among states in the quality of schooling and experience required before a candidate may present himself or herself for examination, and there will be variance among states in pass rates on the license examination. Similarly, for a given licensed occupation and a given state, there will be variance in examination pass rates from one period of time to another. Thus, in some states and at some times, the constraints on entry into a licensed occupation will be stronger or more restrictive than in other states or at other times.

For some occupations, having a license in one state suffices to permit practice of the profession in some other states; for others, having a license in one state suffices to secure a license, without examination, in some other states; in still others, having a license in one state is *not* sufficient to secure a license in other states or to engage in professional practice in other states. In other words, there is variance in reciprocity rules among licensed occupations. In the absence of reciprocity, a practitioner must qualify for examination, pass the exmination, and secure a license in each state in which he or she practices his profession. This diminishes the interstate movement of professionals and impedes the adjustment of the supply of professional services to changes in the interstate structure of the demand for these services.

When campaigns are mounted to have what has been an unlicensed occupation licensed by a state, they are usually organized by incumbent practitioners in the occupation. Statutes that first provide for the licensing of occupations commonly contain what have come to be called "grandfather clauses," which provide that persons practicing the relevant occupation at the time of the initial enactment of the licensing

statute shall be licensed without examination. Current practitioners are thus not required to establish their competence by examination, nor are they necessarily required to fulfill the statute's prescriptions on schooling and experience. It is sometimes said that grandfather clauses are placed in licensing statutes because incumbent practitioners have established their competence by their survival in practice, but it seems clear that their main purpose is to ensure enactment of the licensing statute. Legislatures are not likely to accept a licensing arrangement for an occupation if incumbents make known their opposition to it, and incumbents are likely to oppose, and make known their opposition, if the law threatens their livelihoods and their survival in the occupation.

When licensing laws contain grandfather clauses, the additional costs of entry into the occupation imposed by the laws fall only upon new entrants. Since the cost of entry is then higher for new entrants than it was for those engaged in the practice of the profession at the time the law was enacted, the *net* earnings from the profession are higher for those practicing before the law was passed than for new entrants. When a licensing law thus imposes additional costs of entry upon new entrants to a profession, this produces a monopoly return for the current practitioners: what economists call an economic rent. In general, the size of this monopoly return will depend on the size of the entry costs imposed by the licensing law. New entrants do not get a monopoly return. The licensing law will secure higher earnings for them, but it also imposes upon them higher entry costs. If the market functions well, incrementally higher earnings will be just sufficient to compensate new entrants for higher entry costs. Adjusted for entry costs, earnings will be the same in licensed professions as in similar, unlicensed professions.

In addition to campaigns for the licensing of still unlicensed occupations, campaigns are also mounted for additional legislation affecting already licensed occupations; those campaigns are also frequently coupled with grandfather clauses. Such campaigns propose, for example, raising standards for (cost of) entry into the licensed occupations, extending the definitions of professional practice requiring license, striking down exemptions that permit some professional practice to be done by unlicensed persons, and so on.

When campaigns are conducted to secure the initial passage of a licensing statute for an occupation that is still unlicensed, or to secure stronger constraints on entry into a licensed occupation, or to strike down exemptions that permit unlicensed persons to practice a profession in some defined circumstances, or to broaden the definition of professional practice that can be carried out only by licensed persons, it is almost invariably true that the campaigners will assert that the legislation

they are promoting will serve the public interest. Licensing (or the strengthening or extension of licensing), they say, will assure the public that the quality of the service or products they buy will be of higher and thus acceptable quality because incompetents who have not passed muster and exhibited their competence by successful performance on an examination are excluded from offering their services in the relevant occupation. The public safety, they say, is served by licensing because those offering unsafe service and products are excluded from performing in the relevant profession. Consumers are thus assured that only people of certified competence will make their services legally available.

It is of some interest, however, that consumers rarely engage in campaigns to have occupations licensed, but incumbent practitioners in an occupation often do engage in such campaigns. If the purpose of licensing were to improve the quality of service, one would expect licensing campaigns to be promoted by consumers, who might be the beneficiaries. If we observe that licensing is systematically promoted by practitioners, we might reasonably suspect that it is the interests of the practitioners that are advanced by licensing legislation.

It is, in fact, not unambiguously clear that occupational licensing improves the quality of service and product or that it promotes safety. Licensing, by making entry into an occupation more costly, increases the price of service rendered in the occupation and diminishes the numbers employed in the occupation. As a result, some consumers resort to do-it-yourself methods, and this sometimes results in lower-quality work and less safety than would occur if there were no licensing. In addition, if some consumers are moved from lower-quality to higher-quality consumption as a result of licensing, they will do so at increased expense. The increment of their expenditure for this service will be taken from other things that they might have purchased and, all things considered, they may be made worse off by the enactment of a licensing law. They may, in the economists' jargon, be forced to lower indifference curves. (These ambiguous quality effects of licensing are reinforced by license examinations that test for knowledge and skills sometimes irrelevant to the successful performance of the task of the trade.)

It is sometimes said that the state must act as the agent of consumers and prevent the practice of professions and trades by incompetents in those cases in which information is not symmetrically distributed in markets, in other words, in markets in which sellers know more about the quality of the products and services they offer for sale than do the buyers. In such markets the forces of competition will, we are told, ineluctably lead to the survival only of firms offering commodities of the lowest quality produced at the lowest cost.

In the real world, sellers are specialized producers, and consuming buyers are (generally) nonspecialized households. Producers sell a small number of different commodities; households buy a large number of them. In these conditions of differential intensities of specialization, information appears to be asymmetrically distributed in almost all markets. Sellers would appear systematically to know more about product qualities than buyers generally. Thus, in this argument, we should expect to find only lowest-quality models of commodities offered everywhere, but this is not what we do find. In unregulated markets in which commodities and services may be offered without constraints on entry and without the enforcement of standards of quality by the state, we observe arrays of models offered for sale; competition does not foreclose the entry of high-quality commodities and services. It is clearly apparent to the most casual observer that relatively high-quality goods and services are available (at relatively high prices) in markets for food, clothing, shelter, transportation, education, health care, recreation, and so on.

How can observed experience be reconciled with theoretical expectation? Probably market processes operate in such a way that the assumption of informational asymmetry is rarely fulfilled. Nonspecialized buyers turn out to be not so ignorant of the qualitative properties of commodities and services as they seem to be. They seek out informational surrogates that serve them well. They acquire information by repeatedly purchasing certain commodities; for infrequently purchased commodities, they are informed by the experience of kinfolk, friends, and neighbors. Sellers of complex commodities have market incentives to inform buyers of the qualities of products and services they themselves offer and of those offered by their competitors. Buyers are further informed by inference by the length of life of firms making offers, because it is reasonable to assume that firms with a long life have survived the consensual judgment of the market about the quality of the commodities they offer for sale; shops with professional staffs of buyers serve as surrogate information agents of consumers; and tort law that imposes liability on producers and sellers to "make whole" those whom they harm gives sellers incentives to produce goods and services of a quality that does not fall below some given standard.

It does not appear that competitive markets in the real world serve consumers as badly as the informational asymmetry model suggests they do. Therefore, it does not follow that apparent informational asymmetry should be optimally adjusted for by state enforcement of standards of quality and competence, as through the enactment of occupational licensing statutes.

There is a fairly substantial literature on the economics of occu-

pational licensing, most of which appears in the professional economic journals. The consensus of that literature can be summarized in the following statements:

- Occupational licensing is primarily promoted by practitioners of the occupation rather than by consumers of its services. Licensing primarily serves the interests of practitioners rather than the interests of consumers.
- The public-interest defenses for occupational licensing are of questionable merit.
- Whether licensing of occupations results in improvement in the quality of service offered is debatable. It is not certain that quality of service is improved if a license is required for the performance of an occupation.
- Certification provides consumers with information by telling them that all who are certified in an occupation are qualified in the sense that they have successfully passed the certification examination; but certification does not permit the use of the law to constrain entry into an occupation for purposes that serve the interests of practitioners rather than consumers.
- The licensing of occupations tends to dampen the rate of innovation in the licensed occupations.
- The administration of licensing laws is carried out in ways that reduce the dissemination of information.
- The licensing of occupations permits the definition and enforcement of anticompetitive practices in the delivery of services.
- Licensing has the effect of increasing earnings in the licensed occupations.
- The enforcement of the monopoly right of licensed persons to practice a licensed occupation is frequently undertaken by private professional associations of licensed practitioners who use agencies of the state as instruments of enforcement.
- Examining boards in licensed occupations are frequently composed of licensed persons in the relevant occupation and only infrequently include representatives of consumers of the services of the occupation.
- Examining boards are able to control the rate of entry into a licensed occupation by manipulating the "pass rate" of those taking the license examination. The pass rate will be sometimes high or low, depending on the state of earnings and employment of those already in the licensed occupation. The manipulation of the pass rate is evidence that examining boards administer licensing legislation primarily to protect incumbent licensed practitioners in the licensed occupations.
- When practitioners in an occupation promote the licensing of that occupation, they frequently permit incumbent practitioners to continue to practice in the occupation without being required to pass a competence examination. Incumbents who are thus "grandfathered in" will earn a monopoly return in the practice of the occupation.
- Occupation licensing checks entry into occupations by imposing additional costs of entry.
- Practitioners in a licensed occupation are given an advantage if the standards and costs of entry are made higher than they were when current practitioners entered the relevant occupation. Practitioners have an incentive to promote continuously higher standards and cost of entry into licensed occupations.
- The licensing of occupations inhibits the movement of practitioners among the states, because the possession of a license in one state does not necessarily qualify a person to practice in another state. Therefore, licensing checks the rate at which the allocation of services in licensed occupations among the states can adjust to changes in the locational distribution of the demand for the services of those occupations.
- The licensing of an occupation reduces the number who practice that occupation. Those who are excluded make their way into other occupations; they are less productive in those second-best occupations than they would be in the licensed occupation from which they are excluded.

The papers of this volume, which were prepared for a Conference on Occupational Licensure and Regulation in Washington, D.C., in February 1979, contain findings that sometimes confirm, sometimes question, and sometimes modify the prior consensus of professional judgment on occupational licensing. They constitute an interesting and important contribution to the literature.

The papers discuss explanations for the existence of occupational licensing, the nature and consequences of the forms of social organization implied by licensure, and the history of constraints on entry into occupations. They treat the distribution of the licensing phenomenon among occupations and seek to explain why some, but not all, occupations are licensed and the principles that influence the social decision on which of them will be licensed.

They analyze some of the effects of licensing in some particular occupational contexts: California contractors, registered nurses, and dentists.

These occupational reviews suggest that the licensing of an occupation need not improve the quality of services rendered in it and may increase the price of services in it; that incumbents in an occupation, rather than consumers of their services, may be the main protagonists

for the licensing of their occupation and might be mainly moved in this activity by the desire to reduce the competition for their services of persons in related, but less-skilled, occupations; that sometimes the effects of licensing on earnings in the licensed occupation are not clear-cut; and that licensing limits the movement of licensed practitioners among states, influences the geographical distribution of licensed professional services, and diminishes both consumer and producer benefits generated by professional service.

The papers examine the administration of the law on occupational regulation. One scrutinizes the activities of the Federal Trade Commission in the occupational regulation field, and another reviews the prospective effects on occupational licensing of the sunset legislation adopted by many state legislatures to review periodically and systematically the continuing desirability of public programs and laws. Both papers are, for different reasons, doubtful that the administration of the law in these respects will have a large influence on the quantity of occupational regulation that occurs in the American economy.

The papers also treat the effects of licensing on the employment of blacks, the interstate mobility of members of the licensed occupations, the theoretical principles of professional regulation, the forms of regulation that are open to choice, and the characteristics of market failure, including informational asymmetry that, it is suggested, produce warrants for occupational regulation. All are critically examined by discussants whose comments appear in the volume.

The volume concludes with two conference luncheon addresses by Michael Pertschuk, chairman of the Federal Trade Commission, and George J. Stigler, Charles R. Walgreen Distinguished Service Professor and director, Center for the Study of the Economy and the State, at the University of Chicago.

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LICENSING, MARKET ENTRY REGULATION

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Abstract

Licensing describes the set of regulations that limit service provision to individuals or entities who meet state-established criteria. Despite claims that licensure increases service quality, the effect of licensure on consumption quality is ambiguous. That fact that service providers actively promote licensing has led to the suspicion that licensing benefits these groups at the expense of providers of competing services or consumers. Also at issue is whether information asymmetries or agency costs are strong enough to warrant government intervention. Many believe that, in the absence of government intervention, markets would generate sufficient information through reputation and other mechanisms to meet the needs of consumers.
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1. Introduction

Licensure fits into the broad category of public policy aimed at reducing stubborn agency costs in the marketplace. Where one individual or a group of individuals provides services to another, a divergence of interests is impossible to avoid. There is a fair amount of leeway for the provider (the 'agent') to fail to perfectly represent or serve the purchaser. Although several market mechanisms exist to improve the position of the procurer (also called the 'principal') - to reduce the likelihood that he will encounter an opportunistic agent, or one that purposely and systematically misrepresents her product - none is perfect. Market entry regulation or licensure is most often favored for its perceived ability to offer a layer of protection for consumers.

Licensing involves laws and regulations which limit service provision to individuals or entities authorized to practice by the state. There are three points at which constraints have been imposed. The first is at the point of initial entry. Providers are denied entry if they do not meet established criteria or if legal limits on supply have been met. Second, it is not uncommon to regulate the production process itself. Practitioners who fail to stay within the prescribed set

of permissible activities may have their license suspended or revoked. Finally, outcomes assessment can lead to the discipline of errant providers.

Despite claims that licensure increases service quality, there is a theoretical ambiguity as to the effect of licensure on consumption quality. If, under a system of licensure, the restrictions on service provision shift a sizable portion of consumers to do-it-yourself remedies or to the black market, average quality can decline.

Policy debates about licensure center on justifying entry restrictions and on whether or not the state can assure performance once individuals are granted entry. The identification of qualified personnel is not a sufficient justification for licensure, as this can be accomplished through certification. Certification, or 'voluntary' licensure identifies entities that meet entry standards or standards of performance, but does not restrict the practice of others. Under a system of certification, consumers have access to information about service providers, but they are not constrained from purchasing services from non-certified providers; competition is not limited.

That fact that service providers, trade associations and medical societies actively promote and support licensing has led to the suspicion that licensing benefits these groups at the expense of other providers or consumers (for example, see Rottenberg 1980). Critics of market entry restrictions note that service providers' earnings rise as competition declines and that consumers are left with fewer options and higher prices.

Also at issue is whether information asymmetries or agency costs are strong enough to warrant government intervention. Many believe that in the absence of government intervention, markets would generate sufficient information through reputation and other mechanisms to meet the needs of consumers.

Finally, there is the question of whether there is not some other, preferred form of public policy to insure product quality. Potential alternatives include increased civil and criminal penalties and other institutional arrangements which increase the consequences of malfeasance.

In addition to its proported value in reducing agency costs, two other justifications for licensure have withstood the test of time. One age-old justification for licensure is that it provides protection from external effects associated with the purchase of low quality goods and services. This is an externalities argument. The argument is, essentially, that licensure protects society from the side-effects of poor consumption decisions of its individual members. Another traditional defense of licensure is that some people need to be guided by the state in making choices.

To justify licensure, the benefits must outweigh the losses associated with reduced competition. Not one empirical study has attempted to calculate the net gain. Rather, the focus has been on testing observable implications of licensing restrictions - the effect on earnings, supply, mobility and quality.

Finally, not all licensing arrangements are alike; institutional arrangements that govern licensing boards are of consequence. For example, there is support for the idea that things such as a board's level of autonomy or its source of funding will affect its actions and decisions.

2. Basic Characteristics of Licensing Arrangements

Market entry restrictions can be very simple, an agency may set quantitative limits, precluding further entry once the designated limit has been reached. Quantitative controls are the least common, however. Instead, entry is most often limited by imposing costly barriers to entry. Potential entrants may be required to make specific capital investments, to pass an examination or complete course work in approved programs and to conform with certain personal criteria (age, character, citizenship, criminal record). Where examinations are the basis for licensing, they may be designed and administered by the board, or the board may require passage of an exam administered by another organization.

Filing fees and variations in application procedures affect entry to the profession as well. For example, the score required to pass an entry examination and other rules, such as the number of times an individual may re-take a required examination, may be modified to increase or decrease the difficulty of entry.

Only individuals who have received a license from the state may legally offer services. In health care, 'scope-of-practice' restrictions, which define the extent of the profession, make it illegal for non-licensed individuals to provide similar services.

Reciprocity and/or endorsement in licensing refers to situations where one jurisdiction accepts the license of another as a valid basis for licensure. Without such provisions, professionals must take licensing exams and meet other conditions of entry when they seek to practice in a new jurisdiction.

Once licensed, boards attempt to control service quality. License modification, suspension and revocation are the major tools of discipline available to boards. The state may revoke a license to practice for a variety of reasons including misconduct and incompetence. Standards of proof to which disciplinary hearings are held influence the ability of the board to affectively penalize practitioners, as does the amount of funding allocated to disciplinary functions. Continuing education requirements, which require licensed individuals to take classes or engage in training to maintain their skills, are mandated in some cases.

Although governing bodies have the ultimate power over licensure and discipline, the actual operations are often delegated to a public agency. Some boards are fairly autonomous, others are less so. 'Self-regulation' generally refers to a situation where the board is fairly autonomous and comprised of

representatives of the profession to be regulated.

Because self-regulation includes the potential for professional groups to restrict supply unduly to raise prices, it has been strongly criticized. Proponents of self-regulation argue its merits in circumstances where the skills to be assessed are unique to members of the profession and when consumers would be put at great risk by an incompetent or malfeasant service provider (see Tuohy and Wolfson, 1976).

3. A Brief History of Western Licensure

Rubin (1980) describes the historical patterns in western law that led to modern licensing laws in the United States and other western countries (also see Council of State Governments, 1952; Derbyshire, 1969). According to Rubin, vocational societies were first formed in Europe in the eleventh and twelfth centuries. By the thirteenth century, education became an important separating criteria of the professions. Crafts and trade associations turned to apprenticeship programs to set their members apart. By the fifteenth century, desire for economic security and prestige had resulted in detailed lists of qualifications for entry and practice in almost every vocation.

The private guilds of the Middle Ages - often thought of as the predecessors of modern state restrictions on occupational entry - actually served several purposes. Guilds served social, religious, insurance and trade functions. In exchange for monopoly positions, the private guilds provided a source of tax revenue for monarchs. Hickson and Thompson (1991) suggest that the establishment of guilds served to resolve defense externalities associated with overcapitalization and to connect military-aged youths to their communities in medieval times.

The decline of the feudal structure of the middle ages increased mobility, and led individuals to compete with private guilds. By 1410, Rubin explains that, in England, rules governing entry and practice had fallen to court challenges, reflecting the attitude of the English courts that individual rights to earn a livelihood should be protected. English guilds responded by seeking statutory protection. Over time, representatives of guilds were successful in England and other Western European countries in establishing state-controlled monopolies in many vocations, with social, economic and religious entry standards. Once again, competition was prohibited and control over practice and discipline was left to representatives of the guilds.

This system of public monopolies was overturned in the seventeenth and eighteenth centuries, as economic forces of the Industrial Revolution transformed Western Europe. According to Rubin, as power shifted from monarchs to democratic assemblies, direct licensing evolved. During the

nineteenth and twentieth centuries, many new professions emerged, leading to a resurgence in vocational regulation in Western Europe.

Efforts to license physicians are said to have begun in earnest in the United States with the formation of the American Medical Association in 1846. Up until that time, entry was virtually unrestricted (Hogan, 1983). Lack of support for national licensing left occupational regulation to the states (Rubin, 1980). The first state to pass licensing laws in the United States was Texas in 1873. A West Virginia law, passed in 1881, was challenged in the US Supreme Court in 1889, and the power of the state to license was upheld (Derbyshire, 1969).

The American Nurses' Association and the National League for Nursing launched a campaign to introduce public certification for nurses in the United States in 1900 (White, 1983). By 1923 all states had enacted certification laws for professional nurses. The first mandatory licensing laws were passed in New York and California in the late 1930s.

A 1952 study by the Council of State Governments lists the dates of initial state licensing legislation for occupations in the United States (see also Moore, 1961). Included are professionals in many groups, from accountants and architects to veterinarians and watchmakers. In 1994 the state of California Department of Consumer Affairs licensed more than three dozen classifications of professional and vocational personnel, the largest groups being accountants, automotive repair professionals, barbers and cosmetologists (by far the largest category), contractors, dental assistants, behavioral science professionals, physicians, nurses, professional engineers and land surveyors, and security and investigative service providers.

4. The Economics of Market Entry Regulations

The Simplest Case - Formal Quantity Controls

The simplest case of market entry restrictions is to set formal quantity controls which limit entry to a fixed number of service suppliers. Where more individuals apply for than are granted licenses, market entry restrictions reduce the stock of providers, pushing prices higher than in an unregulated market. Where entry is restricted in this manner, individuals who secure licenses (through random drawings, for example) will earn economic rents; they earn more than similarly skilled individuals in alternative professions. Examples of quantity controls include restrictions on entry in local taxi markets in the United States and restrictions on the number of pharmacists in Belgium (determined by the population and distance between pharmacies).

If sale of licenses is allowed (as is the case with taxi licenses (medallions) in many large US cities and pharmacies in Belgium), the present value of expected future profits will be capitalized in the sale price. The seller captures

all future profits, leaving new entrants with a normal return on their investment. (Frankena and Paulter, 1984, describe taxicab regulation in the United States; see also Gallick and Sisk, 1987. Van den Bergh and Faure, 1991, discuss the licensing of pharmacists in Belgium.)

Whether or not there is a deadweight loss associated with licensure depends on the benefits to consumers. In the extreme case, if there are no benefits to consumers, entry restrictions necessarily result in a deadweight loss to society. As with all restricted markets, resources with a higher value in the restricted market than elsewhere are prohibited from entering. Besides the potential for a deadweight loss from licensure, there may be a loss associated with rent-seeking behavior. If entry is restricted to arbitrarily chosen service providers, there will be a social loss associated with rent-seeking behavior. As potential entrants compete for licenses, real resources are consumed or lost in the rent-seeking process. A third loss may result, depending on conditions in the market, from the non-transferability of professional licenses. Despite not being the lowest cost provider, those who have made sunk, nontransferable investments to obtain a license will remain in the market as long as there is a positive rent on their investment (Lott, 1987, 1989; Gahvari, 1989; Zardkoohi and Pustay, 1989).

Raising the Cost of Entry

The most common form of entry barriers do not arbitrarily assign licenses, but raise the costs of entry by requiring investments of one sort or another. Often, educational and training requirements are specified in detail. Entrants may be required to attend and complete an accredited program that has specific time and content characteristics. The explicit costs of this investment include payments for tuition and books, but the primary cost is usually implicit - the opportunity cost of the applicant's time.

Entry fees, passing marks on state-administered examinations and other requirements (such as citizenship) also make entry more costly. As costs rise, service providers are discouraged from entering the market. Supply declines through retirements, or as demand grows faster than supply, and the price of services rises. Not until earnings rise to offset the increase in costs of entry will new professionals be attracted to the market.

In this situation, although earnings are higher after regulation, new entrants are not earning profits. They earn only a normal return on their (higher) costs of entry. The new market equilibrium will be one with a lower stock of practitioners and higher prices than would have been observed in an unregulated market. Adjusted for entry costs, earnings will be no more or no less than those for similarly skilled individuals in alternative occupations.

A common practice is to 'grandfather' (exempt) existing service providers when entry requirements are made more stringent. This means that only new entrants must meet the stricter requirements; existing providers are not held to

new rules. As higher costs discourage new entrants and earnings and profitability rise, existing practitioners benefit. These gains create incentives for professional associations to lobby for increasingly strict entry requirements over time. It is also possible that 'grandfather' clauses are included to reduce the opposition of less-trained personnel to restrictions that will limit practice to a more elite set of professionals (see White, 1979).

Licensure necessarily results in a redistribution of wealth from consumers to providers as limits on entry cause product prices to rise. Also, there can be significant redistributional effects across consumer groups. For example, if there are economies of scale in producing higher quality services, consumers who desire higher quality services will benefit from licensing laws that require advanced training. In contrast, consumers who prefer lower quality care (due to taste and/or income constraints) are worse off, as the supply of lower skilled providers is reduced or eliminated altogether.

5. The Debate over Occupational Licensing

As may be obvious by now, the debate over occupational licensing is multifaceted. There is disagreement over whether information asymmetries are sufficiently great to justify government intervention, and whether the state can improve upon free consumer choice. Two theories of the role of licensure - that licensure eliminates a 'lemons' problem for consumers and that it decreases the marginal cost of producing quality - fail to justify licensure over certification. Two traditional arguments for licensure over certification - that it reduces the spread of disease and protects those too ignorant to protect themselves - remain. A third justification for licensure is that it creates incentives which mitigate agency costs. The following sections discuss these ideas in detail.

Information Asymmetries

Proponents of licensure argue that consumers have insufficient information to make an appropriate selection from the set of available suppliers. Information asymmetries are thought by some to be unusually strong in health care markets, justifying barriers to entry in medicine (Arrow, 1963; Trebilcock, 1976).

One way for consumers to acquire information about product quality is by direct observation. Also, providers develop reputations over time as their service is tested and re-tested by consumers. Arguments for licensure rest on the premise that, in some markets, direct observation is impractical and reputation fails to offer sufficient protection. If consumers lack information, and if the state (or its agent) can identify and enforce appropriate standards to which practitioners should be held, it follows that state regulation has the potential to improve conditions by limiting entry to professionals who meet those standards.

Writing about medical markets, Pauly and Satterthwaite (1981) suggest that reputation fails when there are so many providers, as would be the case in large cities, that the efficiency of consumer search declines. According to Pauly and Satterthwaite, as the number of physicians within a community increases, consumer information about each physician decreases and it is more difficult to search for a new physician.

Friedman (1962), Rottenberg (1980) and Havighurst (1982) resist the pressure to view consumers as incapable of making reasoned choices in medical markets. Friedman notes that licensure has never been a major source of assurance about physician quality to consumers. Consumers do not choose a physician blindly from the list of licensed physicians but, instead, make choices about physicians on the basis of advice and direction from others, including referring physicians, friends and family. This information, along with specialty board certification (offered by the profession, not the state), offers protection to consumers against physician malfeasance.

One empirical measure, the disparity in incomes among licensed physicians in the United States, supports the premise that consumers are capable of making judgements about physician quality unaided by state licensing regulations. Being licensed did not make International Medical Graduates the equal of US trained physicians in the US medical market (see Svorny, 1979).

Quality Assurance?

With respect to medical markets, critics point out how unfathomable it is that medical licensure provides consumers with useful information upon which to make informed decisions (see, for example, Goodman, 1980; Rayack, 1982; Young, 1987; Benham, 1991). Licensure does not restrict physicians to practice in a particular area of medicine. (In the United States, it is not against the law for an ophthalmologist to perform heart surgery.)

Furthermore, it is hard to argue that passing a standardized exam after graduation from medical school (perhaps after several sittings) offers much information about physician competence or success. Institutional accreditation can only insure that the quality of education meets a set standard, not that the program produces qualified practitioners. Consumers can only gain from licensure if it is possible to assess ability and if greater ability is reflected in higher service quality. Perhaps most important, a licensing exam cannot screen out individuals who might cheat or defraud patients.

Clearly, the case that a public agency can identify practitioners from whom customers may expect to receive the appropriate level of service quality is not convincing. Even Arrow, whose 1963 paper is probably the most-quoted as favoring government intervention to assist consumers, said 'insofar as this is possible' (p. 966).

Surveys of practitioner quality find large percentages of individuals in the market who do not meet standards set by researchers. These results are used to argue that licensure does not assure service quality (Hogan, 1983).

A further complaint is that disciplinary procedures fail to deal with incompetence in professional practice. In the United States, critics of medical licensure point out that the majority of disciplinary actions have nothing to do with competence but, instead, focus on inappropriate prescription of drugs or self-abuse of alcohol or drugs (US Department of Health and Human Services, 1986). A study of disciplinary cases handled by the Antwerp Bar in the 1980s found sanctions most often imposed for personal characteristics (drunk driving, nonpayment of debts) or for improper behavior towards the professional association (such as failure to provide immediate or truthful information).

Low rates of discipline by state boards are cited as evidence that improving quality for consumers comes second to protecting the interests of the licensed professionals. In contrast, Svorny (1987) shows that disciplinary procedures by state medical boards are as common as criminal penalties in the broader population.

Licensure as a Cartel

Many observers complain that licensure fosters cartel-like restrictions which raise prices, benefiting professionals at the expense of consumers (Friedman, 1962; Kessel, 1958; Rottenberg, 1962). The interests of professionals in licensure are seen as primarily self-serving, an attempt to establish monopoly power in an otherwise competitive industry.

Scope-of-practice restrictions, which limit paraprofessionals and others from providing services within the bounds of the licensed profession, contribute to the view that licensing rules are anticompetitive. In medical markets, for example, prohibiting nurse practitioners from prescribing drugs or offering treatment without physician supervision is thought to unduly restrict the potential for optimal division of labor and efficiency in resource use.

Some argue that licensure has been used to sustain hierarchical systems involving multiple occupations (see Glib, 1966; White and Marmor, 1982). In this context, licensure may be both a vehicle for imposing control over subordinate occupations (as when physicians attempt to limit the powers of other allied health personnel through support of strict scope of practice regulation) and for subordinate occupations to challenge the control of dominant occupations (as when nurse practitioners press for the right to provide services traditionally allowed only of physicians).

Where education and training standards are specified, critics lament the lack of opportunity for innovation and the bias toward existing methods of education and training. Why, they ask, should everyone be trained in the same method and with a similar philosophy? In medicine, the lack of competition is

seen as hindering the development of alternative treatments that might improve or prolong lives.

In his 1958 paper, Reuben Kessel painted a damning picture of state medical societies in the United States, suggesting that their actions to limit the supply of physicians were simply efforts to enforce cartel-like restrictions that would raise prices and benefit physicians. Kessel argued that the cornerstone of American Medical Association (AMA) monopoly power was its control over the accreditation of medical schools for the purpose of licensing.

In each state, medical society members had been successful in reserving the right to the AMA to determine what was an appropriate medical school for purposes of medical licensure. Based on this power, Kessel argued that the AMA could control both the number of schools and the rate of production of physicians - limiting the supply of physicians. Schools that did not heed the demands of state societies to limit enrollment could be sanctioned by excluding them from the list of acceptable schools for licensure. As further evidence of cartel behavior, Kessel pointed to AMA efforts to enforce price-fixing schemes (price discrimination) and medical society-enforced prohibitions on advertising.

Resolving a 'Lemons' Problem

One justification offered in support of licensure is that it solves a 'lemons' problem in markets where information about service quality is costly to obtain. Leland (1979, 1980) points out that when consumers cannot identify high quality physicians, all physicians must charge the same fee (equal to the average quality). As a result, the most talented individuals choose other professions (where their superior ability can be revealed). Only the low quality providers (the 'lemons') are left. Under these conditions, Leland shows that setting minimum quality standards will raise the average price and quality of the product. The intuition is that barriers not only exclude the least skilled, but they increase earnings, attracting more able individuals to the market.

Leland emphasizes that his work should be seen as a counter-example to the monopoly/cartel effects of limiting entry. His work shows that it is not true that minimum quality standards can *never* improve welfare. He does not conclude that licensure is desirable. In fact, he supports certification over licensure as a less intrusive way of achieving the same improvement in service quality.

Benefits to a Third Party

In the search for benefits from licensure, White (1987) notes that there may be benefits to firms that hire licensed providers, such as hospitals. He argues that, even if the firms are low-cost monitors of the skills of the service providers and, therefore, do not gain from licensure directly, they may benefit indirectly. First, if consumers' perceptions of service quality increase with licensure, large providers of services (such as health maintenance organizations) benefit from

the short-run profits that accompany an increase in demand for their services. Also, licensure may benefit employers of service providers if it limits their liability. In the case of nurses, White concludes that it does not, as employers of nurses (hospitals and physicians) have been the most active in lobbying against nurse licensing.

A Principle-Agent Framework

It is clear that attempts to justify licensure must rest on quality assurance. There are two issues associated with quality assurance, finding individuals who are qualified, and motivating them to perform in the interests of the individuals they serve. The second problem is a principal-agent problem. One individual (the principal) hires another (the agent) to do some work, but the disparity in their self-interests causes problems for the principal in getting the agent to do as he or she would like.

Shapiro (1986) describes how licensure might be seen as a means to resolve the incentive problem associated with the agency relationship in medical markets. In Shapiro's model, entry restrictions magnify physicians' incentives to acquire reputation by reducing the marginal cost of producing quality. The premise is that physicians who have made investments in medical education can produce high quality services with less effort. Because it is easier for them to do a good job, they do so more often.

The value of licensure in Shapiro's model is predicated on their being some market value to professional reputation (due to imperfectly observable outcomes), but insufficient production of reputation in an unregulated market. Shapiro justifies standardized training requirements (often seen as evidence of AMA control) on the basis that it is otherwise costly to reveal training levels to consumers.

Licensure vs. Certification

Like that of Heyne, Shapiro's model provides a theoretical justification for licensure in response to complaints that licensure is motivated by self-interest on the part of practitioners who want to limit competition. But, both authors explicitly state that a system of certification would produce the same results, and neither argues for licensure over certification.

Economists have long favored certification over licensure (see Friedman, 1962). Economists favor certification because consumers can use certification as a guide, but may purchase care from non-certified practitioners if they so choose. As Leland notes, under certification 'buyers have a wider range of choice ... they can buy low-quality goods or services if they wish' (p. 283).

Support for licensure over certification comes from two traditional arguments. First, there may be significant externalities associated with the consumption of physician services. If the bad care that one person receives

makes someone else worse off - as is the case if infectious disease is not treated properly - then it might be desirable to constrain the sale of physician services (through licensure) to those individuals who have been trained to keep infectious disease from spreading.

Of course, if the higher cost of licensed professionals shifts large numbers of consumers into do-it-yourself remedies, infectious disease may spread even more under a system of licensure than without it. Or, if the high price of licensed electricians causes consumers to attempt electrical repairs themselves, the result may be an increase in externalities - home fires that threaten adjacent properties.

A second common justification for licensure is paternalistic. Society may, as a whole, decide that some people are not smart enough to make their own choices and that the government should decide for them. However, a counter argument is that if this not-smart-enough group of individuals is also poor, the higher prices under licensure may lead them to even poorer choices in the black market than they would have made in an unregulated market.

Theoretical Support for Licensure over Certification

Is it possible to justify licensure over certification on grounds other than externalities and the need to make choices for others? Svorny (1987, 1992) suggests that licensure is useful in reducing agency costs in the market for physician services, an objective that certification is unable to accomplish.

Licensure's barriers to entry result in (1) abnormal profits and (2) investments in medical training that are lost when malfeasance leads to license suspension or revocation. Profits and the return on investments are accessible to the physician as long as he or she acts in ways deemed appropriate by the state medical board. Svorny argues that the profits created by simple restrictions in supply may serve as a premium stream to discourage agent malfeasance.

Similar to an 'efficiency wage' arrangement which pays workers a wage above their value elsewhere, licensure produces an earnings stream that is lost upon license suspension or revocation. The higher earnings and potential for loss create incentives for agents to act in the interest of the principle, to self-monitor. Such arrangements are thought to prevail when monitoring costs are high (see Lazear, 1981). Along the same lines, Van den Bergh and Faure (1991) suggest that a 'confidence premium' in price fixing arrangements may be justified on the basis that trust of a professional economizes on information costs.

By requiring internships and apprenticeships, licensing can steepen professional earnings profiles, creating strong penalties for malfeasance. Wages are depressed initially, but then rise above market values later in professional careers to compensate for the initial investment. This means that, as they enter the profession of their choice, new entrants to a licensed profession earn less that they would earn elsewhere. For example, those who wish to be certified

public accountants in California must work for two years in jobs that pay very low wages and require long hours to qualify for licensure. Once licensed, wages rise above what could be earned elsewhere. Fear of losing this return through the revocation of one's license discourages malfeasance.

In medicine, a malfeasant physician loses not only the return to his or her required investment in training, but also the profits generated by restricting entry. Discipline results in a substantial loss. Blair and Kaserman (1980) and Gellhorn (1956) emphasize the incentive effects of disciplinary sanctions, but do not emphasize the potentially valuable role of licensure in increasing those losses by making medical practice more profitable. Under a system of certification, non-certified individuals would compete with certified practitioners, making it impossible to maintain abnormal profits to discourage physician malfeasance.

Svorny proposes that the value of licensure rests on the inability of alternative methods of government intervention to provide a severe enough penalty for opportunistic behavior. Because agents can avoid civil and criminal fines (through asset flight or bankruptcy), the maximum penalty that can be assessed through alternative methods may not be sufficient (see also Eaton and White, 1983). Similarly, if it is not feasible to fully bond agents because of concerns about moral hazard by principles (Shapiro and Stiglitz, 1984), licensure may be preferable to bonding arrangements.

Taking the view that profits in the market for physician services are welfare-enhancing, one can argue that restrictions on advertising (often mentioned as evidence of cartel activity) are desirable as they protect the abnormal profitability generated by restrictions on entry. Following the same logic, state requirements that physicians be US citizens (now illegal) may have served the purpose of maintaining profitability in the market for physician services.

The physician price fixing schemes that Kessel found so offensive may actually have been socially useful. In contrast to profits created by limiting the quantity of services provided, price discrimination raises physician income in an efficient way. Price discrimination transfers wealth from consumers (consumer surplus) to physicians without affecting resource allocation. At the extreme, perfect price discrimination (where each consumer is charged the most he or she is willing to pay), allows large wealth transfers with no social cost or deadweight loss. Quantities sold are as they would be in a competitive market.

Barriers to Taxicab Entry

Barriers to entry can similarly benefit consumers of taxicab services. In many cities, restrictions on entry to taxi markets result in substantial profits. Only taxicabs drivers that own medallions issued by the government are allowed to offer taxi services, making the medallions very valuable. Gallick and Sisk

(1987) describe how the profits associated with ownership of a medallion benefit consumers. They argue that regulating taxi rates makes consumers better off by reducing redundant search, allowing riders to cheaply estimate the price of any particular trip without searching among alternative drivers. One problem is that average pricing encourages drivers to seek out trips to locations where the probability of finding a return fare is relatively high. To mitigate this negative effect of average pricing rules, incentives must exist to encourage drivers to accept trips randomly, to reject no one. Gallick and Sisk suggest that the potential loss of a valuable asset, the taxi medallion, discourages drivers from violating the law that requires drivers to accept all trips, assuring all riders of access to average priced service.

The 'Value' of Licensure Falls when Incentives of Other Actors Change
Changes in institutional arrangements can increase or decrease the societal value of licensure arrangements. For example, in the United States, where the courts have shifted liability for physician malfeasance to hospitals and health maintenance organizations, incentives have surely changed. Coupled with growing concern over reputation in increasingly competitive markets, hospitals and HMOs have moved toward serious internal peer review. Also, record keeping has progressed to the point that profiling physician practice and maintaining disciplinary databases is possible, making it possible to identify physicians who practice outside of professional norms. This includes physicians who inappropriately dispense narcotics, a large share of disciplined physicians in the United States. Under these circumstances, the argument for licensure to assure quality in medical markets is weakened significantly (see Haug, 1980; Stevens, 1986; Ginsberg and Moy, 1992, Svorny, 1992,).

6. Evidence

Much of the discussion of the value of licensure includes arguments that are not empirically testable. For example, the fact that licensure has existed in many parts of the world and for many years is used to suggest that it must have some value to society (Leffler, 1978).

Empirical Problems
Where researchers do attempt to empirically test for the consequences of licensure, or the factors that lead to licensure, they run into problems. Researchers often use licensing examination pass rates to proxy the strictness of licensing regulations in a particular jurisdiction. The problem with this is that pass rates are not exogenous, they are determined by both the supply of

potential entrants and the degree of strictness of the regulatory authority. Similarly, attempts to assess the wage impacts of licensing regulations may be hindered by a relationship between wages and the ability of a professional group to lobby for entry regulation. If the passage of licensing laws is endogenous to market conditions, then attributing high wages to licensing laws may be inappropriate.

Another empirical problem that seems to pervade much of the literature is that of potentially spurious correlation. A researcher who finds an inverse relationship between licensing exam pass rates and service provider earnings often concludes that there is causality between these two variables. It is not uncommon to draw the conclusion that licensing boards manipulate pass rates to benefit service providers at the expense of consumers. However, where consumers are relatively wealthy, there may be a relatively high demand for quality that results in both strictness of licensing criteria and high service provider earnings.

This literature is not alone in having to deal with problems of spurious correlation by any means. As always, researchers must be careful in assigning causality to observed empirical relationships.

A caveat is appropriate as well for the empirical studies that examine the effect of licensure on quality. Because quality is very hard to measure, researchers must use proxies whose connection to service quality can only be presumed. The studies of Carroll and Gaston (discussed below) have used innovative measures to proxy for quality. But, clearly, the usefulness of these studies in assessing the outcomes of licensure depend critically on the ability to find good proxies for quality.

The Demand for Licensure

Examining the market for physician services, Leffler (1978) finds licensing laws to be most restrictive (he uses examination pass rates and other proxies) in states where consumer demand for quality would be expected to be relatively great, suggesting that consumer interests influence the political decision-making process.

Proxies for the demand for service quality have been empirically studied to see if they are associated with licensing in two other studies. A study of Certified Public Accountants by Donabedian (1991) finds stricter licensing requirements in states having high concentrations of large businesses, his proxy for a demand for quality. In a study of nurse licensing, White (1987) finds adoption of mandatory licensing for nurses to be positively related to a relatively high demand for the services of registered nurses (the nursing category that involves the most training). Whether it is easier to get licensing laws through in these states because consumers have fewer objections, or whether the laws actually improve consumer welfare, cannot be determined from these results.

Professional Influence

Although individual service providers have much to gain from licensing restrictions, their ability to control the regulatory arena depends on several factors. As Stigler (1971) and Peltzman (1976) note, the odds of passage of market entry regulations are greatest where gains are concentrated among a small group of service providers, where the costs of professional organization are relatively low, and where costs are spread across a large segment of the population (this reduces organized consumer opposition).

Looking at self-regulating professions in Illinois, Moore (1961) concludes that the set of licensed professions reflects the relative advantage of certain occupations in lobbying the legislature. In his view, self-interest has played a large part in the establishment of licensing restrictions.

White (1987) notes that state nursing associations have uniformly led local efforts to pass licensing laws. But a nursing lobby variable in his regressions on the introduction of mandatory licensing of registered nurses (RNs) is not significant. Nor do Svorny and Toma (forthcoming) find evidence that numerically strong state medical societies influence either board structure or the number of physicians in a state.

In contrast, Begun, Crowe and Feldman (1981) find evidence of professional influence over the degree of state regulation of optometry. Work by Graddy (1991) suggests that a range of organized interest groups influence occupational regulation, and that the public interest also plays a role. Noether (1986) interprets evidence of increased competition in medical markets in the United States since 1965 as suggestive of declining professional influence over physician licensure.

Paul (1984) examines the effect of state medical society lobbies on the onset of licensure. He finds a positive relationship between AMA membership and the early onset of licensing. However, AMA membership per capita is highly correlated with the physician/population ratio in a state, which is not included in the regression. Paul's results may simply confirm what the demand for licensure studies have found; where consumers already purchase large quantities of physician services relative to other health care services, licensure restrictions on practice face less opposition from consumers.

Evidence Relating to Cartel Restrictions

Attempts have been made to use measured profitability to provide evidence of cartel-like supply restrictions on the part of the medical profession. Early studies found a medical career to be profitable (Friedman and Kuznets, 1945; Sloan, 1970; Fein and Weber, 1971). Lindsay (1973) argued that there were a variety of issues in measuring returns that these papers failed to address. Differences in work hours and non-pecuniary benefits make direct comparisons of professional income less than perfect in assessing physician profitability. Also, Lindsay suggests that the appropriate rate to use to discount future

earnings should include a risk premium, as investments in medical education leave the individual undiversified. Lindsay's recalculation of the returns to training estimated in previous studies produced no evidence of above normal returns to medical training.

Psacharopoulos (1975) reviews the literature and concludes that the evidence does not fully support the existence of monopoly incomes. Of course, normal returns for new entrants can be consistent with above-normal returns for those members of the profession 'grandfathered' as entry barriers are increased.

Two studies challenge the premise in Kessell (1958) and elsewhere that the supply of physicians is constrained through the ability of the AMA to limit enrollment in medical schools. Leffler and Lindsay (1981) find that a traditional market model, focusing on supply and demand, is sufficient to explain the relationship between the market for care and the market for medical education. Hall and Lindsay (1980) examine enrollment in medical schools in the United States. They find medical school output positively related to donor and applicant demand. These results are inconsistent with the hypothesis that medical school enrollments are controlled by organized medicine.

Earnings

Empirical evidence supports the premise that earnings rise with restrictive licensing policies, that supply declines, that mobility is restricted, that inputs are combined inefficiently, and that consumers lose access to low quality services. Studies by Benham and Benham (1975) (the optometric profession), Benham, Maurizi and Reder (1968) (physicians and dentists), Pfeffer (1974) (insurance agents and brokers, real estate brokers and salesmen, plumbers), Shepard (1978) (dental care), White (1978) (clinical lab personnel), Perloff (1980) (the construction industry), Pazderka and Muzondo (1983) (Canadian licensure), Haas-Wilson (1986) (optometry) and Van den Bergh and Faure (1991) (Belgian attorneys, architects, physicians, and pharmacists) have shown measures of licensing strictness to be positively associated with costs, prices or earnings.

Efficient Division of Labor

Two studies have looked at the effect of licensure on the efficient division of labor. Examining the eyewear industry, Maruizi, Moore and Shepard (1981) find a low representation of opticians where restrictive regulations favor optometrists. Devany et al. (1982) examined dental firms in the United States. They find evidence that state legal restrictions on the use of paradentals have resulted in dentist-paradental labor input ratios higher than would be observed in unregulated markets.

Labor Market Mobility

Licensing may be used to limit mobility of service providers across political jurisdictions. For example, the costs of preparing for unique state exams has the potential to deter movement across state borders. But limited mobility does not necessarily accompany licensure. In medical markets in the United States, the trend has been to move away from state-specific toward standardized exams, which then allows almost perfect mobility across states.

Holen (1965), Pashigian (1979), Pratt (1980), and Kleiner, Gay and Greene (1982) examine the effect of entry restrictions on professional mobility. Pratt examines sixteen occupations in the United States and finds that the more states that license a profession, the less mobile are its workers. Kleiner, Gay and Greene look at fourteen occupations and find that where rules are the most strict, mobility is limited and earnings enhanced by licensure. Both Holen and Pashigian find mobility restricted for dentists and lawyers.

That earnings are higher and professionals less mobile should come as no surprise. Restrictions on entry, by definition, reduce mobility, raise professional incomes, and shift the sale of low quality services to the black market, reducing their availability. The real question is whether consumers gains are sufficient to offset the negative effects of licensure.

Svorny (1987) suggests a test for the relative influence of consumer and professional interests over licensure. If licensure benefits consumers (by lowering search and monitoring costs), licensure should cause the demand for services to increase, increasing consumption despite higher costs of entry. If there are no benefits to consumers, there will be no increase in demand, and the equilibrium quantity of services will be lower where barriers are the most strict. Finding this, she is led to conclude that physician interests dominate the regulatory process. This, however, assumes homogeneity among consumers. Licensure may have redistributional effects, so that benefits accrue to some groups of consumers and practitioners (for example, those in the high quality sector of the market), but make other members of both groups worse off.

Service Quality

Despite claims that licensure enhances service quality, it is possible that high prices shift some consumers to do-it-yourself remedies. Aggregate quality may rise or fall, depending on the extent and consequences of such shifts (Carroll and Gaston, 1983). Attempts to measure the effects of licensure on product quality are limited by the difficulty in measuring quality.

Carroll and Gaston (1981a) identify variables likely to proxy poor quality in seven licensed occupations. For example, in the market for electricians the number of accidental deaths by electric shock is used as a proxy for quality. Electrical shock deaths could result when ill-skilled professionals provide services or when consumers turn to do-it-yourself repairs. Carroll and Gaston

find a negative association between proxies for strict licensing regulations and the number of licensed professionals, from which they conclude that licensing restricts entry. Also, where there are fewer licensed professionals, their proxies for quality suggest lower quality services are being consumed. They conclude that licensure reduces quality. Turning to real estate markets, Carroll and Gaston (1979) find lower quality (proxied by the proportion of vacant houses on the market for more than six months) where licensing restrictions were the most strict.

Maruizi (1980) looked at contractor licensing in California. Over the period from 1954 to 1975, he found average quality (measured by the number of complaints) declined. He attributes this decline to the rapid growth in exam-preparation schools, which allowed relatively poorly trained individuals to pass the exam.

Other results suggest that entry barriers are quality enhancing. Carroll and Gaston (1981b) found measures of attorney quality to be higher in those states with the most restrictive licensing policies. Johnson and Loucks (1986) find licensing in real estate improves quality; a reduction in licensees results in a decrease in complaints per transaction. Using length of eye exams, office equipment and examination complexity as proxies for service quality, Begun (1981) found quality to be positively related to optometry standards. McChesney and Muris (1979) provide evidence that eliminating barriers (in this case on advertising) does not reduce the quality of legal services provided to consumers and appears to increase it.

The empirical work on quality suggests the effect of licensure on service quality varies across occupations. The need to proxy quality, with what are clearly imperfect measures of how consumers view a product, makes it hard to draw strong conclusions about the effects of licensure on quality.

7. Licensure vs. Discipline

Where markets fail to protect consumers, it is possible to view licensure and discipline as substitutes in the production of service quality. Dollars spent on licensing could be shifted to efforts to identify and discipline incompetent and malfeasant practitioners, with a potential loss or gain, depending on the relative incentives generated. Guntermann and Smith (1988) address this issue, but with very weak data. They find that dollars spent on compliance and enforcement efforts reduce complaints against licensed real estate agents. Finding no evidence that prelicensing education requirements reduce complaints, they conclude that state governments are best off allocating more of their dollars to enforcement efforts and less to efforts to assure prelicensing educational attainment. (See also Phelan's 1974 examination of TV repair in three cities.)

8. The Choice

Despite years of debate, there is no clear agreement on whether state licensing improves consumer welfare. Where consumers can easily buy low quality services on a black market, there will be little impact on consumer welfare. But where black market provision of services is costly (as, perhaps, with surgical procedures, where the consumer must travel to another country), consumers seeking to purchase low quality services are worse off. Because they restrict the supply of professional services available to consumers, market entry restrictions can be welfare enhancing only if the gains to consumers offset the welfare loss associated with the reduction in supply.

Because service providers tend to be more organized than consumers and individual service providers have much to gain from restricting licensure, economic theory tells us that a democratic political process will overshoot the optimal/socially desirable level of entry restrictions. (Ramseyer, 1986), however, discusses the lack of success lawyers have had in Japan in furthering their own interests.)

Only where consumers are well-organized or jointly represented by larger entities, as is increasingly the case in health care markets in the United States, will service providers have problems in securing protective regulation that goes beyond socially optimal levels of control (Stigler, 1971). What this means is that our choice is not between socially optimal regulation and an unregulated market, but between sub-optimal regulation and an unregulated market.

Horowitz (1980) suggests that the persistence of self-regulation suggests a deal between society and the profession. Consumers can be sure of a minimal level of competence in exchange for allowing self-serving licensing restrictions to persist.

Finally, an attraction of licensure to politicians is that its costs are hidden to consumers. Stigler (1971) makes the point that politicians prefer regulation whose primary cost is indirect and hard to identify over regulation involving public funds and tax expenditures. Licensing arrangements are attractive becuase their costs are off-budget, they are generally funded through the assessment of periodic fees on service providers. With a licensing scheme, all consumers - those who find value in regulation, and those who do not, pay a hidden cost of regulation in the form of higher priced services.

9. Institutional Issues

Given the incentive for the regulated profession to lobby for rules which benefit the profession at the expense of consumers, a corollary question is whether it is politically possible to achieve an institutional structure which will reduce or

eliminate the major imperfections associated with state regulation.

Institutional arrangements have the potential to influence the regulatory outcome by affecting the costs special interest groups face in lobbying the agency (see Svorny and Toma, forthcoming). For example, in the United States, variations in institutional arrangements across states include differences in board autonomy in the nomination and selection of members, the ratio of professional to public or lay members on the board, standards for disciplinary procedures, and whether the board is self-funded, through fees, or receives an allocation of funds from the state legislature. The challenge is, first, to identify institutional arrangements that lower the costs of special interest lobbying and, second, to reach a political equilibrium where such arrangements are precluded. This is not a simple task, as interest groups will fight to protect arrangements that increase their influence over public policy.

10. Who Should be Licensed?

Given the lack of clear evidence that licensure benefits consumers, some areas of practice are clear targets for eliminating state regulation over entry. Where services are characterized by repeat purchases and where outcomes are clearly observable, as is the case with the services of barbers or hair stylists, it seems hard to justify state controls.

Similarly, the benefits of licensing dental and physician assistants may outweigh the costs. The employing professional or the employing facility has the ability (through observation, reputation and knowledge of professional training) to ascertain the quality of an assistant. Where there is also a strong legal incentive to assess quality, licensing professional assistants appears redundant.

In the case of physicians, a system of certification would work as well in most circumstances. The only suggested theoretical value of licensure over certification is in creating a profit stream that discourages malfeasance.

In the United States, because physicians practicing in hospitals and working for health maintenance organizations are subject to peer review (with teeth added by the increased liability assigned to such institutions by the courts), perhaps it is only physicians working in sole practice, or in small communities with no institutional liability and no professional peer oversight, for whom continued licensure is desirable.

The ironic part is that states with disproportionate rural or medically underserved communities have been the first to innovate *away* from physicians, extending the legal scope of practice for physician assistants (Jones and Cawley, 1994). Shortages of medical doctors in rural areas have led governments to be more flexible, allowing greater latitude for paraprofessionals

to offer services. If existing law shifts from licensure in areas where, theoretically, it can be of value relative to certification, it is hard to argue the benefits of licensure's restrictions on entry for the population as a whole.

Institutional licensure has been proposed to reduce the burden of licensing on state agencies. Hershey (1969) proposed replacing licensing with a system that invests health services institutions and agencies with the responsibility of regulating the provision of services. He argues that the rigidity of the current system deters hospitals from grouping skills and capabilities in ways that best serve patients. Replacing the current system with one of institutional licensure would allow a greater degree of flexibility in assigning personnel, reducing the cost of providing services.

Each market is different and broad prescriptions about licensure just do not apply. For example, the licensing of taxicabs may be of value where taxicabs primarily service travelers. The lack of repeat customers, and the externalities associated with treating travelers well (that is, more tourism), may call for large penalties for malfeasance, exactly what a medallion system can supply. Although it is not clear that a national or international brand name would not be established to provide quality assurance at airports and other tourist locations if local taxi monopolies were to be eliminated, the externalities with respect to tourism may justify local control.

Taxicabs operating within a community, serving the needs of those who do not drive, are subject to repeat purchases, so that licensure is an unnecessary expense. On the other hand, if taxis serve a very elderly population, one that may have greater than average difficulty in protecting itself from unscrupulous providers, then penalties offered by the medallion system for malfeasance take on value (and perversely, given the population, raise prices). The potential for large losses if malfeasance is caught creates incentives for licensed individuals to behave in ways that benefit their clientele, even if that clientele is not a good monitor of quality.

Future Research

One area that has received little attention is the allocation of public funds between licensing and discipline. Clearly substitutes for one another, it would be interesting to see if most jurisdictions allocate their spending efficiently, equating the marginal product of both activities at the margin.

Also useful would be research assessing the net value of licensure to society. Ad hoc presumptions that licensure benefits consumers are clearly challenged by researchers that have studied regulated occupations. Trading an imperfect regulatory solution for an imperfect market solution may not be worth the cost.

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Self-Regulation in Optometry

The Impact on Price and Quality*

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This study provides an empirical analysis of the effects of advertising and commercial practice on the price and quality of optometrists' services. Data were collected by actually purchasing eye examinations and eyeglasses from optometrists in cities with and without restrictions on advertising and commercial practice. Analysis of the data supports the view that advertising and commercial practice lower prices but do not lower the quality of professional care available in the market. The implications of these findings are discussed.

THE ISSUES

Proponents of control on advertising and commercial practice argue that restrictions are necessary, both to protect unwary consumers from unscrupulous professionals and to maintain high levels of quality. They argue that because professional services are largely intangible, complex, or difficult to assess, advertising professionals may offer services at lower prices but then substitute low- for high-quality care. Many professionals argue that advertising will allow such sellers to reach a substantial pool of potential customers and that competition will force high-quality professionals to lower their prices and quality of care in order to

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"meet competition." Thus advertising will produce a lowering of quality throughout the market. According to this theory, the professionals who do not want to lower their standards of quality will be driven out of the market because consumers will gravitate to the lower-priced professionals.

In contrast, those who oppose commercial restrictions argue that certain professional services are, in fact, relatively routine. For such services consumers should benefit from shopping on the basis of price. Commercial restrictions on advertising raise the cost of shopping and result in higher prices in the market. Commercial restrictions on forms of practice may reduce the opportunity for sellers to adopt cost-cutting technologies and to pass those savings on to consumers in the form of lower prices. The argument concludes that the primary effect of commercial restrictions for professional services is to raise the prices consumers must pay for these services. Therefore, some consumers will not purchase the kinds of services needed or will do so less often. This argument is consistent with empirical evidence concerning consumer behavior in other areas of economic activity involving routine goods and services.

Because commercial behavior in the professions has been so widely restricted, there has been little opportunity to examine the relation between commercialism and the price and quality of professional services. Nonetheless, for a considerable period of time there existed a great variety in the degree of restrictions for optometric services. Some states and cities had no restrictions on either advertising or commercial practice, and others had complete prohibitions on both. This study was designed to compare the relative price and quality of optometric services across regulatory environments and kinds of practice. The study does not purport to measure the absolute level of quality of optometric services available, nor can the study be used to compare optometry with other professions providing primary eye care.

THE EXPERIMENT

To examine the effect of advertising and commercial practice on the price and quality of optometric services, trained subjects were sent to various cities to purchase routine eye examinations and eyeglasses.

Behaving like ordinary consumers, subjects purchased eye examinations and (in most cases) eyeglasses from optometrists in restrictive cities, where advertising and commercial practice were prohibited, and in nonrestrictive cities, where advertising and commercial practice were permitted.

Classifying Cities[1]

Cities were distinguished by the type of mass-media advertising observed on eye examinations and eyeglasses as well as by whether large chain optical firms

[1]The terms "cities" or "metropolitan areas" will be used to describe what were in reality Standard Metropolitan Statistical Areas (SMSAs) in the survey methodology.

operated in the market. Mass-media advertising was monitored in the Yellow Pages and in newspapers. No attempt was made to obtain measures of radio and television advertising by optometrists or local optical firms.[2] In the most restrictive cities, essentially no advertising of either eyeglasses or eye examinations was observed. In the least restrictive cities, there was price advertising of eyeglasses and at least nonprice advertising of eye examinations.

To evaluate the effect of large chain optical firms on the price and quality of optometric services, cities were further classified by whether or not large chain optical firms sold eyeglasses and eye examinations. In nonrestrictive cities, large chain optical firms sold both eye examinations and eyeglasses. There were no large chain firms in restrictive cities. It was anticipated that large chain firms might enjoy economies of scale in both purchasing and distribution. Such economies lead to lower prices, not only from the firms themselves but also from optometrists competing with them.

Classifying Optometrists

Restrictive cities, by definition, did not include either optometrists who advertised in the media or optometrists who worked for large chain firms. Except for a few optometrists who advertised on site, all were necessarily nonadvertisers.[3]

Nonrestrictive cities included three major types of optometrists: nonadvertisers, advertisers, and large chain firms.[4] Nonadvertisers were defined as optometrists who listed in the Yellow Pages only such information as name, address, and telephone number. Mention of "eye examination" and perfunctory directions was also considered acceptable; use of boldface type was not. Nonadvertisers did not include optometrists who advertised in the newspapers or optometrists who advertised on site. Advertising optometrists were defined as optometrists or local optical firms that advertised in the Yellow Pages or the newspapers. Large chain firms were identified by using a list, supplied to the Federal Trade Commission (FTC) by a trade association, of major retail optical firms. Such firms advertised in the Yellow Pages or in newspapers, often under the heading of "Opticians," and had outlets in more than one state or SMSA.

Training Subjects

Nineteen experienced survey interviewers, each with relatively routine visual problems, were selected and trained to identify, recall, and record the major components of a complete eye examination. The training took place on the campus

[2]Obtaining such data would have required that local television and radio stations be contacted, and it was feared that requests for such data might reveal that the cities were in the survey, thereby possibly biasing the results. It was anticipated that most radio and television advertisers would also advertise in the newspapers and the Yellow Pages.

[3]The few optometrists who had either large signs or window displays were classified as on-site advertisers. Such optometrists were treated as a separate group throughout the analysis.

[4]Again, some optometrists did have either large signs or window displays even though they did not advertise in the media. Such on-site advertisers were treated separately throughout the analysis.

Table 1. Estimates of Average Prices Charged for Examinations and Eyeglasses, $N = 280$[a]

	Most restrictive cities	Least restrictive cities
All optometrists	$94.46	$70.72
Nonadvertisers[b]	94.64	73.44
Advertisers	None	63.57
Chain firms	None	61.37

[a]*Note:* The estimates in Table 1 are predicted values derived from an ordinary-least-squares equation. Multivariate analysis was used to correct for possibly important determinants of price other than the presence of advertising and large chain optical firms. The corrections are for subject-to-subject variation in prescriptive needs, city-to-city variation in optometrists per capita, and city-to-city variation in adjusted income per capita. Because the prices are predicted values, they are not necessarily the average prices observed in the sample cities.
[b]Excludes optometrists who advertise on site.

of the State University of New York, College of Optometry (SUNY), November 7–10, 1977. Reviewing and testing took place at the Pennsylvania College of Optometry (PCO) on November 11, 1977. The training, which was completed just prior to the field work, provided subjects with an understanding of the procedures, tests, and equipment commonly employed in routine eye examinations. The training also prepared the subjects for completing debriefing sheets subsequent to each examination purchased in the field. Both schools performed complete eye examinations on each subject. The examinations provided the baseline data necessary to evaluate the accuracy of the prescriptions received.

Although the optometrists who were visited were not aware of either the experiment or their participation in it, the subjects themselves were informed about the nature of the research. Accordingly, not all parties to the experiment were "blind." The subjects were, however, carefully instructed on the importance of objectivity in completing the debriefing sheets.

THE RESULTS

Price

The discussion that follows focuses first on price, second on quality, and finally, on the relation between price and quality.

The analysis here focuses only on the most and the least restrictive cities. Prices are for the combined price of an examination and eyeglasses and were determined from receipts that each subject requested.[5]

Table 1 presents estimates of the average total prices charged for examina-

[5]Prices are net of taxes. Some data were also collected on the price of the eye examinations. Analysis of the data yields a pattern similar to the pattern shown for the combined price.

tions and eyeglasses in the most and least restrictive cities. The estimates are based upon a sample of 280 observations where both eyeglasses and eye examinations were purchased. The estimates suggest the following:

1. The average price charged by all optometrists is $23.74 lower in the least restrictive cities than in the most restrictive cities.[6]
2. The average prices charged by advertisers and chain firms in the least restrictive cities are about the same; both are $10 to $12 lower than the prices charged by nonadvertisers in the least restrictive cities.[7]

Summary. The total prices charged for eye examinations and eyeglasses are significantly lower in the least restrictive cities. Large chain optical firms, advertising optometrists, and even nonadvertising optometrists all charge less in these cities than optometrists in the most restrictive cities. The lowest prices are those charged by large chain optical firms and other advertising optometrists.

Quality

Many professionals argue that price comparisons such as those above fail to take account of any quality differences and are therefore not meaningful. For services as potentially complex as those offered by professionals, the assumption of equal quality may not be warranted. This section explores quality by focusing on four dimensions of the services purchased: (1) thoroughness of the eye examination; (2) accuracy of the prescription; (3) accuracy and workmanship of the resulting eyeglasses; and (4) extent of unnecessary prescribing. For each dimension of quality, a description of the measure is presented, followed by an analysis of the results.

The Thoroughness of the Eye Examinations

Measures. Subjects completed a debriefing sheet for each eye examination taken during field work. The debriefing sheets included the following: the identity of the examining optometrist; whether or not the optometrist advertised on site; and questions about the thoroughness of the examination, including these important components: the case history, the eye-health examination, the vision test, and the discussion of findings. Subjects were also asked to estimate elapsed time for an important procedure or test as well as for the examination as a whole,

[6]All categories of optometrists in the least restrictive cities charge prices significantly lower than the prices charged by nonadvertising optometrists in the most restrictive cities. The $21.20 difference between nonadvertising optometrists in the most and least restrictive cities is significant at the .01 level ($t = 5.06$). The $31.07 difference between nonadvertisers in the most restrictive cities and advertisers in the least restrictive cities is significant at the .01 level ($t = 7.19$). And the $33.27 difference between nonadvertisers in the most restrictive cities and chain firms in the least restrictive cities is significant at the .01 level ($t = 7.29$).

[7]The $9.87 difference between nonadvertising optometrists and advertising optometrists in the least restrictive cities is significant at the .01 level ($t = 5.33$). The $12.07 difference between nonadvertising optometrists and chain firms in the least restrictive cities is also significant at the .01 level ($t = 4.75$).

excluding the selection of frames and lenses. For each question, subjects were asked to respond "Yes," "No," or "Don't remember." If they were at all confused, subjects were asked to write down the circumstances leading to their uncertainty.

Subsequent to the field work, each debriefing sheet was read by FTC staff. Copies purged of identification data were also read by study advisor Dr. Kenneth Myers, Ph.D., O.D., Director of the Optometric Service, Department of Medicine and Surgery, U.S. Veterans Administration. By reviewing subjects' remarks explaining their uncertainty, Dr. Myers was able to complete answers to some questions. Weights were then applied to denote the importance of the various components, including procedures and tests, of each examination. Working with the College of Optometry, State University of New York (SUNY) and the Pennsylvania College of Optometry (PCO), Dr. Myers developed the set of weights associated with scores, designated below as "FTC Index." The National Association of Opticians and Optometrists (NAOO), a group representing commercial optometrists, developed the set of weights associated with scores designated as "NAOO Index."[8] Both indexes are stated as percentages, so that an examination in which all appropriate tests had been performed would have a score of 100.[9] Although the two different weighting systems were used to determine whether the results were sensitive to potentially different professional points of view, the resulting scores are highly correlated; this suggests that the study results are basically insensitive to the weighting system used.[10]

Although all of the procedures and tests that received positive weights were considered important, both weighting systems give positive weights to procedures that are less than critical. A 70% score does not necessarily imply that only 70% of important tests were performed. Each index merely provides a continuum that can be used to make comparisons across regulatory environments and kinds of practice. It should also be emphasized that the measures presented are measures of inputs rather than outputs. Thus, whether or not an examiner would have found the pathology (had it been present) can be inferred only indirectly.

Results. Table 2 below presents the estimates for average thoroughness of the eye examinations, as measured by the FTC and NAOO Indexes. The estimates are derived by classifying all cities as either restrictive cities, where there were no large chain optical firms, or nonrestrictive cities, where large chain optical firms sold both eyeglasses and eye examinations. The estimates are based on a sample of 434 observations.

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[8]The American Optometric Association, the National Optometric Association, and the Association of Schools and Colleges of Optometry were also asked to supply additional sets of weights, but declined.

[9]Where subjects could not remember whether or not a procedure had been performed, the point values were deducted from both the actual score and the possible score. Thus, an exam would score 100 percent if all tests that the subject could remember had been performed.

[10]Analysis of the overall indexes was also supplemented by analyses of major components of the examination, including the frequencies with which important tests were performed. The results revealed a pattern similar to that observed for the overall indexes.

Table 2. Estimates of Average Thoroughness of Eye Examinations, $N = 434$[a]

	Restrictive cities		Nonrestrictive cities	
	FTC index	NAOO index	FTC index	NAOO index
All optometrists	58.5	61.0	61.6	63.7
Nonadvertisers[b]	58.8	61.6	70.0	72.1
Advertisers	None	None	47.4	51.4
Chain firms	None	None	51.6	54.2

[a]*Note:* Each score is a predicted value derived from an ordinary-least-squares equation. Multivariate analysis was used to correct for subject-to-subject differences in evaluations, state-to-state differences in optometrists per capita, and city-to-city differences in percent change in population.
[b]Excludes optometrists who advertise on site.

The estimates suggest the following:

1. Examinations purchased from optometrists in restrictive and nonrestrictive cities are, on average, of about equal thoroughness.
2. Examinations purchased from large chain firms and advertising optometrists are, on average, less thorough than examinations purchased from the nonadvertising optometrists in nonrestrictive cities.[11]
3. Examinations purchased from nonadvertising optometrists in nonrestrictive cities are, on average, more thorough than examinations purchased from nonadvertising optometrists in restrictive cities.[12]

The estimates in Table 2 present a seemingly complex picture. Nonadvertising optometrists in nonrestrictive cities appear to be different both from their advertising counterparts in the same cities and from their nonadvertising counterparts in restrictive cities. To better understand the data underlying the estimates, frequency distributions were created for the various types of optometrists in nonrestrictive cities. The types include the three for which estimates were presented in Table 2, plus a fourth type of optometrist, who did not advertise in the media but who did advertise on site.[13] The distributions shown here are for the FTC Index only but distributions for the NAOO Index show similar patterns.

[11]For the FTC index, the 22.6-point difference between nonadvertising and advertising optometrists is significant at the .01 level ($t = 3.08$); the 18.4-point difference between nonadvertising and chain-firm optometrists is significant at the .05 level ($t = 2.14$). For the NAOO index, the 20.7-point difference between nonadvertising and advertising optometrists is significant at the .01 level ($t = 3.51$); the 17.9-point difference between nonadvertising and chain-firm optometrists is also significant at the .01 level ($t = 2.59$).

[12]For the FTC index, the 11.2-point difference between nonadvertising optometrists in restrictive and nonrestrictive cities is significant at the .01 level ($t = 4.16$). For the NAOO index, the 10.5-point difference is also significant at the .01 level ($t = 4.35$).

[13]As with the estimates presented in Table 2, each score is a predicted value from an ordinary-least-squares equation. Multivariate analysis was used to correct for subject-to-subject differences in evaluations, state-to-state differences in optometrists per capita, and city-to-city differences in percent change in population.

The frequency distributions in Figure 1 show visually what the estimates in Table 2 suggest. Nonadvertising optometrists tend to offer higher-quality examinations than large chain firms and both types of advertising optometrists. The distributions also reveal substantial variation within each type of optometrist.

By combining the four distributions in proportion to the number of optom-

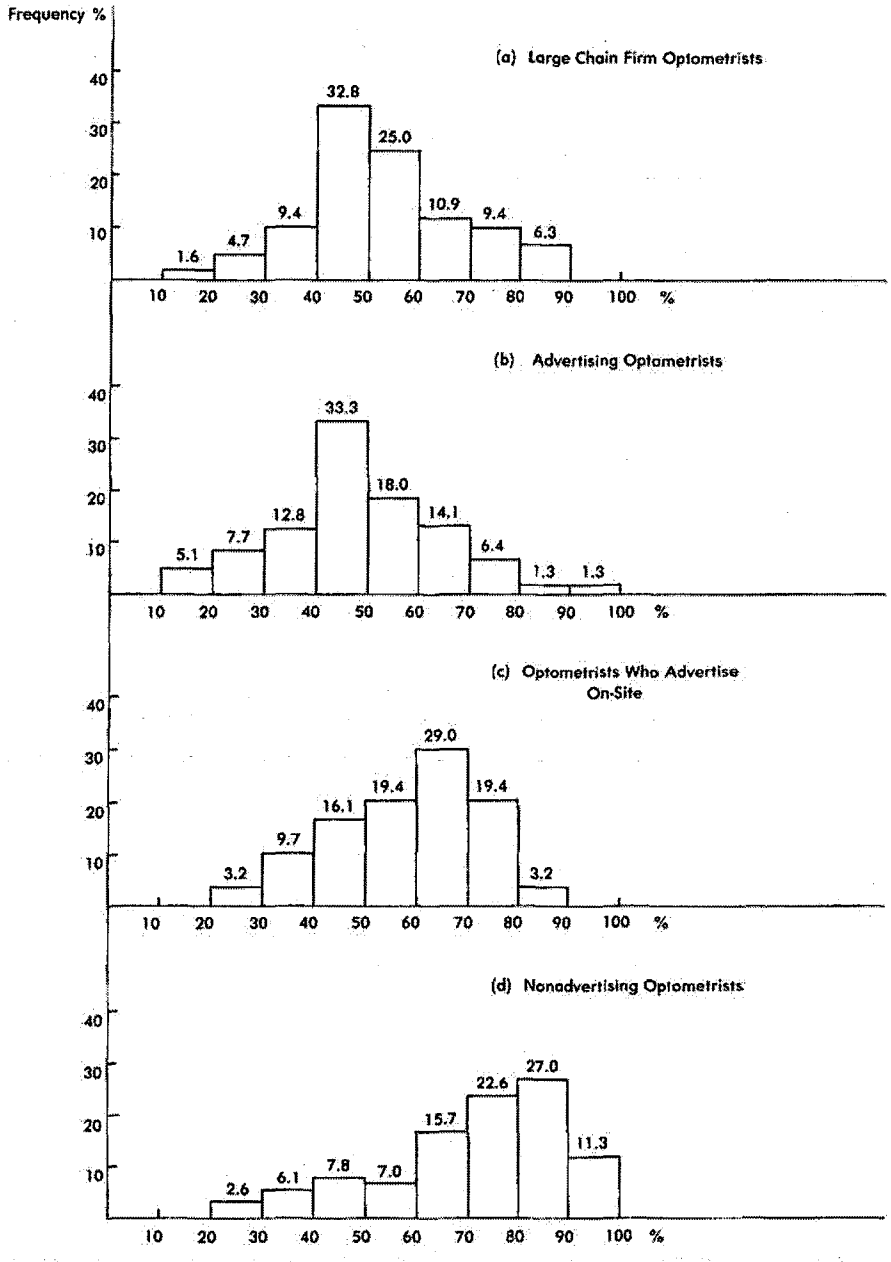

Fig. 1. Distributions of examination thoroughness, by type of optometrist, in nonrestrictive cities (FTC Index). Source: Bureau of Economics, FTC.

etrists in each type, a distribution for all optometrists in each kind of city can be created. The combined distribution of examination scores for nonrestrictive cities may then be compared to the distribution for restrictive cities.

Figure 2 presents the combined distributions for restrictive and nonrestrictive cities. The distributions reveal substantial variation within both restrictive and nonrestrictive cities, but the variation is remarkably similar. Within each kind of city, substantial percentages of the examination scores are both much higher and much lower than the averages. In nonrestrictive cities, less thorough examinations tended to be purchased from advertising optometrists and chain-firm optometrists. In restrictive cities, less thorough examinations were available from at least as large a percentage of optometrists. But the optometrists could not advertise or practice commercially. Hence, whereas nonadvertising optometrists in nonrestrictive cities appear to give more thorough examinations, virtually all optometrists in restrictive cities are nonadvertisers, and no such pattern can be observed.

Summary. In nonrestrictive cities, less thorough eye examinations tend to be given by advertising optometrists and chain-firm optometrists; more thorough

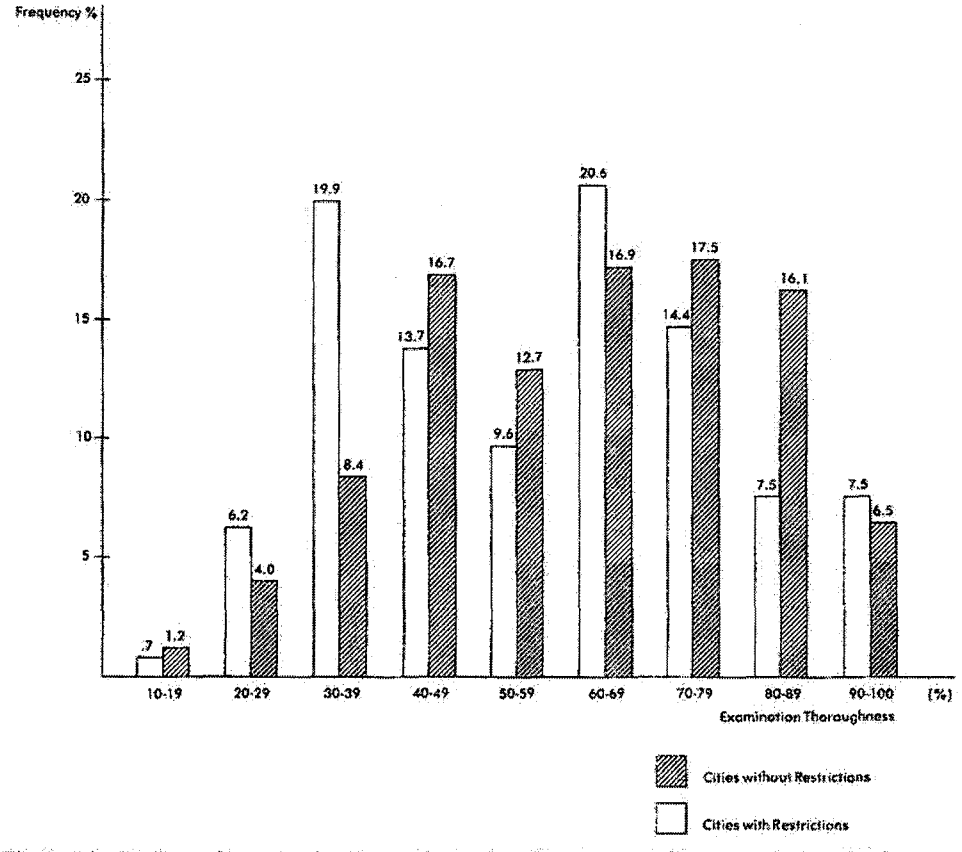

Fig. 2. Distributions of examination thoroughness, in cities with and without restrictions (FTC Index). Source: Bureau of Economics, FTC.

examinations tend to be given by nonadvertising optometrists. In restrictive cities, the variation across practitioners in the thoroughness of examinations is about as great as it is in nonrestrictive cities. Virtually all optometrists in restrictive cities are nonadvertisers, however, since none can advertise in the mass media. Despite the variation, the average thoroughness of examinations in restrictive cities tends to be similar to the average thoroughness of examinations in nonrestrictive cities, where the average is taken across all optometrists, regardless of type.

Optometrists giving thorough examinations do not appear to be driven from nonrestrictive cities. Fully 55% of the optometrists in nonrestrictive cities do not advertise, either in the media or on site. And a slightly greater percentage of the optometrists in nonrestrictive cities give high-scoring examinations than optometrists in restrictive cities. About 23% of the optometrists in nonrestrictive cities versus about 15% of the optometrists in restrictive cities give examinations having an FTC Index of 80% or higher. About 40% of the optometrists in nonrestrictive cities versus about 29% of the optometrists in restrictive cities give examinations with an FTC Index of 70% or higher. The NAOO Index shows a similar pattern.

The Accuracy of the Prescriptions

Subjects were instructed to request a copy of the prescription at the conclusion of each examination. After removing information identifying the name and any affiliation of the prescribing optometrists, the prescriptions were forwarded to each of the consulting schools of optometry. The faculty at each school was asked to make a clinical pass/fail judgment concerning the appropriateness of each prescription received in the field. The judgments were based upon the detailed examination records the schools had compiled on the subject during the training session. Differences of opinion between the schools were due to differing assessments of the subjects' needs or to differing application of professional judgment. The data suggest that PCO judged slightly fewer prescriptions adequate than SUNY.

Table 3 presents estimates of the percentage of the prescriptions judged appropriate by one or both of the schools. The estimates are based upon the entire sample of 400 observations, and they suggest that optometrists in nonrestrictive cities obtain the correct prescriptions slightly, but not significantly, more often than optometrists in restrictive cities.[14] Analysis of estimates of the percentage of prescriptions judged appropriate by each school individually leads to similar conclusions.

Summary. Statistical estimates suggest that advertising and chain-firm optometrists produced prescriptions no less appropriate than those of nonadvertising optometrists, in both restrictive and nonrestrictive cities.

[14]The *t*-value for the six-point difference between nonadvertisers in restrictive and nonrestrictive cities is 1.17. The *t*-value for the eight-point difference between nonadvertisers in restrictive cities and advertisers in nonrestrictive cities is 1.49. The *t*-value for the four-point difference between nonadvertisers in restrictive cities and chain firms in nonrestrictive cities is 0.51. None of the differences is significant at conventional levels.

Table 3. Estimates of the Percentage of Prescriptions Judged Appropriate by One or Both Schools, $N = 400$[a]

	Restrictive cities	Nonrestrictive cities
All optometrists	82	88
Nonadvertisers[b]	82	88
Advertisers	Not applicable	90
Chain firms	Not applicable	86

[a]*Note:* Each score is a predicted value derived from a probit maximum-likelihood regression. Multivariate analysis was used to correct for subject-to-subject differences in evaluations, state-to-state differences in optometrists per capita, and city-to-city differences in percent change in population.
[b]Excludes optometrists who advertise on site.

The Accuracy and Workmanship of the Eyeglasses

Eyeglasses purchased by the subjects were mailed to the FTC, where the glasses were coded with numbers to identify the dispensing optometrists. Labels engraved on the nosepieces and earpieces were taped so that glasses from large chain firms could not be identified. The eyeglasses were first shipped to PCO, where an automated lensometer (a sophisticated instrument to read and print out measurements) was used to measure decentration, sphere, cylinder, axis, and prism of each lens. Each pair of eyeglasses was then subjected to judgmental clinical evaluations. Eyeglasses were compared to the written prescriptions by the faculties at PCO and SUNY to determine whether they were adequate for the patient.[15]

Table 4 presents the percentage of eyeglasses judged adequate by PCO, SUNY, or both.[16] The estimates are based upon samples of 217 observations,[17] and they suggest that adequate eyeglasses are prescribed with about the same frequency in both restrictive and nonrestrictive cities.[18]

Like the clinical evaluation of adequacy, the evaluation of workmanship in-

[15]In addition to the clinical evaluation, each pair of eyeglasses was subjected to a mechanical standard. Eyeglasses were judged accurate if the prescriptions for them met tolerances established in the 1972 American National Standards Institute (ANSI) Z80.1 guideline standards. The results using the ANSI standards were statistically similar to the clinical evaluations.

[16]Whether or not the prescription was judged adequate to meet the subject's needs, the eyeglasses were compared with the prescription. From an individual patient's point of view, both the prescription and the eyeglasses must be accurate, or any errors must be compensating.

[17]The data were analyzed excluding the observations taken in two cities where the experiment became known prior to receipt of the glasses. Also, observations were excluded in seven instances where the optometrist did not provide a prescription.

[18]The t-value for the two-point difference between nonadvertisers in restrictive and nonrestrictive cities is 0.31. The t-value for the eight-point difference between nonadvertisers in restrictive cities and advertisers in nonrestrictive cities is 1.08. The t-value for the three-point difference between nonadvertisers in restrictive cities and chain firms in nonrestrictive cities is 0.34. None of the differences is significant at conventional levels.

Table 4. Estimates of the Percentage of Eyeglasses Judged Adequate by One or Both Schools, $N = 217$[a]

	Restrictive cities	Nonrestrictive cities
All optometrists	85	87
Nonadvertisers[b]	84	86
Advertisers	Not applicable	92
Chain firms	Not applicable	81

[a]*Note:* Each score is a predicted value derived from a probit maximum-likelihood regression. Multivariate analysis was used to correct for subject-to-subject differences in evaluations, state-to-state differences in optometrists per capita, and city-to-city differences in percent change in population.
[b]Excludes optometrists who advertise on site.

volved subjective judgment. Accordingly, PCO and SUNY were asked to complete questionnaires consisting of the following questions: (1) Did the lenses have any significant imperfections? (2) Were the lenses edged and mounted well? (3) Did the frames have any significant imperfections? Workmanship was judged adequate if the answer to each of the three questions was yes. Since the eyeglasses were mailed to the subjects, no measure of fit is available.

Table 5 presents estimates of the percentage of eyeglasses judged of adequate workmanship by PCO, SUNY, or both. The estimates are based upon a sample of 224 observations,[19] and they suggest that the eyeglasses received in nonrestrictive cities are of inadequate workmanship no more frequently than the eyeglasses received in restrictive cities.[20] Analysis of each school's judgments individually yields similar results.

Summary. Statistical estimates suggest that neither advertising nor commercial practice adversely affect the accuracy or quality of the eyeglasses.

The Extent of Unnecessary Prescribing

One hundred twenty-three examinations were taken by five subjects, each of whom arrived at the examination wearing eyeglasses with a prescription that the consulting optometrists believed to be appropriate. At the end of each examination, the subjects recorded the examining optometrist's recommendation concerning whether or not new glasses would be beneficial. The subjects were instructed to tell the optometrists that they wanted to purchase new eyeglasses *only* if the eyeglasses would make a real difference in their ability to see. The data are analyzed to see which examinations resulted in a recommendation of

[19]The data were analyzed excluding the observations taken in two cities where the experiment became known prior to the receipt of the eyeglasses.

[20]In fact the results are in the opposite direction. The 13-point difference between nonadvertisers in restrictive and nonrestrictive cities is significant at the .05 level ($t = 2.05$). The four-point difference between nonadvertisers in restrictive cities and advertisers in nonrestrictive cities is insignificant at conventional levels ($t = 0.54$). And the six-point difference between nonadvertisers in restrictive cities and chain firms in nonrestrictive cities is also insignificant at conventional levels ($t = 0.72$).

Table 5. Estimates of the Percentage of Eyeglasses Judged of Adequate Workmanship by One or Both Schools, $N = 224$[a]

	Restrictive cities	Nonrestrictive cities
All optometrists	82	92
Nonadvertisers[b]	81	94
Advertisers	Not applicable	85
Chain firms	Not applicable	87

[a]*Note:* Each score is a predicted value derived from a probit maximum-likelihood regression. Multivariate analysis was used to correct for subject-to-subject differences in evaluations, state-to-state differences in optometrists per capita, and city-to-city differences in percent change in population.
[b]Excludes optometrists who advertise on site.

new glasses even though the prescription was judged correct. A sample size of 92 observations is used; this analysis only includes recommendations from optometrists who derived essentially the same prescriptions as the ones for the eyeglasses the subjects were already wearing.

Table 6 presents estimates of unnecessary prescribing by kind of city and type of optometrist. Because the sample sizes are relatively small, only substantial differences between estimates are statistically significant. The differences that do emerge are contrary to the hypothesis that chain firms and advertisers prescribe unnecessarily more frequently than nonadvertisers in restrictive cities.[21] Hence, a larger sample would be unlikely to suggest an opposite conclusion.

Summary. Statistical estimates suggest that advertising optometrists and large chain firms do not unnecessarily recommend new eyeglasses more frequently than nonadvertising optometrists.

Quality: A Summary

Analysis of the thoroughness of eye examinations suggests that there is substantial variation in both restrictive and nonrestrictive cities. In nonrestrictive cities, less thorough examinations are given by advertising optometrists and large chain firms. In restrictive cities, less thorough examinations are given by about the same percentage of optometrists, but by definition, such optometrists can neither advertise nor work for large chain firms.

Analysis of the accuracy of the prescriptions, the accuracy and workmanship of the eyeglasses, and the extent of unnecessary prescribing suggests that advertisers and large chain firms perform no worse than nonadvertising optometrists in either restrictive or nonrestrictive cities. The data suggest that consumers who

[21]None of the differences is significant at conventional levels, however. The t-value for the 29-point difference between nonadvertisers in restrictive and nonrestrictive cities is 1.28. The t-value for the 23-point difference between nonadvertisers in restrictive cities and advertisers in nonrestrictive cities is 0.90. And the t-value for the 26-point difference between nonadvertisers in restrictive cities and chain firms in nonrestrictive cities is 1.06.

Table 6. Estimates of the Percentage of Optometrists Prescribing Unnecessarily, $N = 92$[a]

	Restrictive cities	Nonrestrictive cities
All optometrists[b]	36	9
Nonadvertisers[c]	36	7
Advertisers	Not applicable	13
Chain firms	Not applicable	10

[a]*Note:* Each score is a predicted value derived from a probit maximum-likelihood regression. Multivariate analysis was used to correct for subject-to-subject differences in evaluations, state-to-state differences in optometrists per capita, and city-to-city differences in percent change in population.
[b]This includes only optometrists who derived the correct prescription.
[c]Excludes optometrists who advertise on site.

purchase an eye examination only to get the correct prescription and an accurate pair of eyeglasses may safely shop on the basis of price. In addition, the data suggest that on average, large chain optical firms and other advertising optometrists appear to charge prices lower than the prices charged by nonadvertising optometrists. If, however, a consumer is interested in having a thorough eye examination, the data suggest that more thorough examinations are likely to be obtained from nonadvertisers. But even with nonadvertisers, consumers in nonrestrictive cities appear to have an advantage. In nonrestrictive cities, the decision not to advertise or practice commercially appears on average to be associated with a decision to offer a more thorough examination. In restrictive cities, no such association can be made. Nonadvertisers appear to give more thorough examinations in nonrestrictive than in restrictive cities; and the data suggest that they also charge lower prices.

But the data reveal substantial differences in the thoroughness of examinations, not only between but also within cities and types of optometrists. Comparing prices for nonhomogeneous services may be misleading; it is therefore necessary to analyze the relation between price and quality.

The Relation Between Price and Quality

Table 1 shows that optometrists associated with large chain firms and those who advertise charge lower prices than the nonadvertisers. Table 1 also reveals that optometrists in the most restrictive cities charge higher prices than nonadvertisers in the least restrictive cities. Yet the analysis of the thoroughness of eye examinations shows substantial variation. In nonrestrictive cities, the variation is associated with advertising and commercial practice. In restrictive cities, variation is just as substantial, but optometrists who give less thorough examinations can neither advertise in the media nor practice commercially. Because of the substantial variation in thoroughness, it is important to compare the prices of examinations of similar thoroughness.

The following results are based on statistical estimates of the price of eyeglasses plus an eye examination holding quality constant. The estimates are for nonadvertisers in the most restrictive cities, nonadvertisers in the least restrictive cities, and large chain firms (which only exist in nonrestrictive cities).[22] The estimates suggest the following:

1. Eyeglasses and an eye examination of similar thoroughness cost less when purchased from a nonadvertiser in the least restrictive cities than when purchased from a nonadvertiser in the most restrictive cities. On average, the cost difference was about $21 for examinations having the same FTC Index.[23]
2. In the least restrictive cities, eyeglasses and an examination of a given thoroughness cost less when purchased from a large chain firm than when purchased from a nonadvertiser. On average, the cost difference is about $10 for examinations having the same FTC Index.[24] Note, however, that previous results suggest that more thorough examinations are much more frequently available from nonadvertisers than from chain firms.
3. Eyeglasses and an examination of a given thoroughness cost less when purchased from large chain firms than when purchased from nonadvertisers in restrictive cities. On average, the cost difference is about $31 for examinations having the same FTC Index.[25]

SUMMARY AND CONCLUSIONS

The purpose of this study has been to analyze empirically the effect of advertising and commercial practice on the price and quality of optometric services. The relation has been a matter of some dispute. Proponents of advertising and commercial practice have argued that such behavior increases competition and lowers prices. Opponents have argued that such behavior lowers the quality of professional care available in the market.

The data in this study support the view that advertising and commercial practice lower prices. Very thorough examinations and eyeglasses cost on average $21 less in markets where advertising and commercial practice are allowed. Less thorough examinations and eyeglasses cost on average $31 less when purchased from a large chain optical firm than when purchased from an optometrist in a market without advertising and commercial practice.

The data are not consistent with the view that advertising and commercial practice lower the quality of professional care available in the market. The average quality of eye examinations available to consumers is about the same whether or not advertising and commercial practice are allowed.

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[22]The estimates are predicted values derived from an ordinary-least-squares equation. Multivariate analysis was used to correct for variation based on quality, optometrists per capita, income per capita, and subjects. The multivariate analysis is based upon 280 observations, but the estimates presented here are for the most and the least restrictive cities only.

[23]The difference is significant at the .01 level ($t = 5.07$).

[24]The difference is significant at the .01 level ($t = 3.83$).

[25]The difference is significant at the .01 level ($t = 6.76$).

Optometrists of all types provide adequate prescriptions and eyeglasses with about the same frequency. Substantial variation does exist, however, in the thoroughness of the examinations. Overall, about the same percentage of optometrists give less thorough examinations in both restrictive and nonrestrictive cities. In nonrestrictive cities, the less thorough examinations tend to be given by advertising and chain-firm optometrists. In restrictive cities the less thorough examinations are, by definition, given by nonadvertising, noncommercial practitioners.

Some have argued that advertising or chain firm optometrists would be more likely to prescribe eyeglasses unnecessarily or perform unneeded tests and services because they are more profit oriented than nonadvertising professionals. Chain-firm optometrists might be especially vulnerable to this charge, since their employers' primary interest is the selling of eyeglasses. This study found no significant difference in the incidence of unnecessary prescribing of eyeglasses between advertising and nonadvertising optometrists or between individual advertising optometrists and optometrists employed by the large chain optical firms.

In many states, professionals are prohibited from being employed by corporations not owned or controlled by professionals. Proponents of these regulations believe that commercially employed professionals may be encouraged to engage in cost-cutting conduct that compromises professional standards of quality. Data in this study do not confirm this view. Optometrists who are either employed by or sublet space in the large optical outlets give examinations that are on average no less thorough than examinations purchased from advertising optometrists not associated with large chains. Nor are there any significant differences in the appropriateness of the prescriptions or the adequacy of the eyeglasses.

ECONOMIC REPORT
SEPTEMBER 1980

Effects of Restrictions on Advertising and Commercial Practice in the Professions: The Case of Optometry

by

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This report has been prepared by the Bureau of Economics of the Federal Trade Commission. It has not been reviewed by, nor does it necessarily reflect the views of, the Commission or any of its members.

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PREFACE

This is a revised edition which replaces the April 1980 edition. Minor changes have been made in Figure 3 and Tables 1, 3-3, 3-4 and 3-12. Textual references to Figure 3 and the tables have also been revised.

The study is divided into two self-contained parts. Part I offers a non-technical discussion of the essential aspects and findings of the study and will probably be more useful to noneconomists. Part II presents a detailed analysis of the issues, the methodology, and the results. The results presented in Part I are derived from the statistical analyses described in Part II.

PART I

HIGHLIGHTS OF THE STUDY

The Issues

Proponents of controls on advertising and commercial practice argue that restrictions are necessary both to protect unwary consumers from unscrupulous professionals and to maintain high levels of quality. They argue that because professional services are largely intangible, complex, or difficult to assess, advertising professionals may offer services at lower prices but then substitute low for high quality care. Many professionals argue that advertising will allow such sellers to reach a substantial pool of potential customers and that competition will force high quality professionals to lower their prices and quality of care in order to "meet competition." Thus advertising will [illegible] of quality throughout the market. According to this

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The Economic Aspects of Unsupervised Private Hygiene Practice and Its Impact on Access to Care

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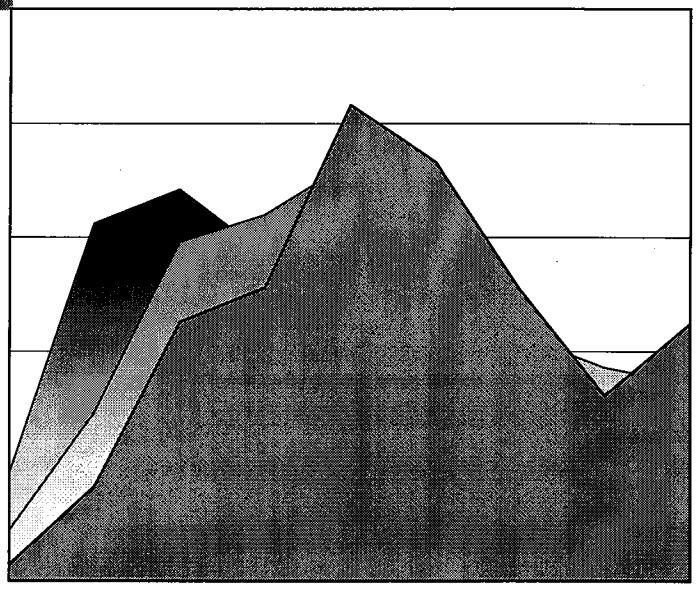

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The Economic Aspects of Unsupervised Private Hygiene Practice and Its Impact on Access to Care

DENTAL HEALTH POLICY ANALYSIS SERIES
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ABSTRACT

BACKGROUND

The unsupervised practice of dental hygiene at locations remote from a dental office is a relatively new occupational choice in the United States. This paper reports on a study that analyzed the economic aspects of unsupervised private hygiene practice and its impact on access to care in Colorado where this type of practice is permitted.

METHODS

The authors developed a theoretical model of unsupervised practice of dental hygiene that describes the economic characteristics of this mode of practice. They collected and analyzed data from existing unsupervised dental hygiene practices in Colorado, as well as from nearby dentists.

RESULTS

The authors identified 17 practices of unsupervised hygienists in Colorado that were separate from dentist's offices and did not include supervision by a dentist. The practices included 20 hygienists because some practices had more than one hygienist. Prophylaxis fees for adult patients were generally similar for unsupervised hygienists and neighboring dental practices. Prophylaxis fees for children were largely similar, but three unsupervised hygienist practices were distinctly different in their fees for children. Two practices had fees that were greater than the average fee of neighboring dentists and one was less than the average fee of neighboring dentists.

CLINICAL IMPLICATION

Unsupervised private dental hygiene practice has not had a notable effect on access to care in Colorado. The impact of those practices is limited in two important ways: 1) there are very few practices; and 2) they are located in areas served also by dental offices with traditional dental hygienists. The economic viability of the unsupervised hygienist business model is questionable because their prophylaxis fees, on average, are not different from traditional dental practices, which have the advantage of providing a full range of practice services. This may explain why independent hygienist practices have not expanded substantially in a state where they are permitted.

INTRODUCTION

The traditional role of a dental hygienist has been as a member of a dental team employed in a dental practice. The current practice model places the dentist as the head of the practice of dentistry in the office and as the supervisor of the dental team (which includes dental hygienists, dental assistants, laboratory technicians and other dental staff members).

Differences in the supervision of dental hygienists within the current practice model reflect both state dental practice acts and the styles of practicing dentists. Supervision of the work of hygienists can vary from relatively strict supervision of hygienists and their patients to indirect supervision that allows flexibility regarding work and patient conditions within the dental practice.

A relatively new occupational choice is that of less supervised or unsupervised practice of dental hygiene at locations remote from a dental office. These range in degree of dentist's supervision, from indirect and periodic review of hygiene services performed by a hygienist while a dentist is not present in the office to a broad collaborative relationship between a hygienist and a dentist, with the hygienist practicing at a location remote from the dentist. Truly unsupervised practice of hygienists implies the practice of dental hygiene independent of the dentist and the dental practice. Currently, however, Colorado is the only state that permits unsupervised dental hygiene practice.[1]

This study addresses the economic viability and the characteristics of unsupervised private practice of dental hygiene by dental hygienists in Colorado. Unsupervised hygiene practices in other circumstances, such as community health centers, are not addressed in this study.

CONCEPTUAL FRAMEWORK

Definition of Unsupervised Practice

According to one definition of unsupervised practice, a hygienist operates a dental hygiene practice in facilities within which a dentist does not practice. This is the stand-alone hygienist practice, located in a facility designed only for hygienists. The practice is owned and operated by a dental hygienist. A licensed dentist does not have any ownership or management responsibilities and is not present during the time in which the practice is open for business.

Alternatively, the dental hygienist could operate an unsupervised practice within the facilities of a dental practice but operate only when the dental practice is not open for business. An example would be a hygienist who leases a dentist's facilities a few nights per week and perhaps on weekends. The owner-dentist is never present during these times, and thus it is not possible for the patient to receive preventive services and diagnostic services in the same sitting. The main advantage to the hygienist of practicing within the facilities of the dental practice is the cost efficiencies of leasing a dental practice facility instead of establishing different facilities.

Finally, a hygienist could provide services to an institution or organization on a contractual basis. In this model, the hygienist is reimbursed according to a fee schedule or capitated arrangement to provide preventive services to a specific population or defined patient group, such as nursing home residents, schoolchildren or patients in behavioral health or long-term care facilities. The hygienist operates out of existing institutional facilities or uses portable or mobile equipment.

Economic Theory

An economic consideration of hygienists' services requires an initial understanding of the demand side of the market. There are four economic concepts that are important for understanding the economics of unsupervised dental hygiene practice. These are substitutes, complements, scope of service and combining of services.

[1] Colorado State Dental Practice Act, Paragraph 12-35-122.5.

Substitutes. In economics, a good or service is said to be a substitute for another kind, insofar as the two kinds can be consumed or used in place of one another in at least some of their possible uses—for example, margarine and butter.[2] The fact that one good can be substituted for another has immediate economic consequences insofar as the professional services of the hygienists are concerned.

For preventive services, the services of the hygienist and the services of the dentist might be viewed as interchangeable economic substitutes. The patient may be well served by the services of either professional. The dentist can serve as a substitute provider for the hygienist just as the supervised hygienist can serve as a substitute provider to the unsupervised hygienist. More importantly, the services of the supervised hygienist can be viewed as a perfect substitute for the services of the unsupervised hygienist – that is, they both provide equivalent services. Therefore, the unsupervised hygienist can gain a competitive advantage only by charging lower fees or by providing services where a dental practice is not present in the same local area or at times when a dental practice is not open for business.

Complements. Complementary services are the opposite of substitutes.[2] They are used together. An example of complementary goods is hamburgers and hamburger buns. If the price of hamburgers falls, more hamburgers will be bought. This, in turn, means more hamburger buns would be sold because the two usually are used together.

For certain combinations of professional dental services, the services of hygienists and dentists are viewed as complementary services. A patient commonly receives the services of the hygienist in conjunction with the diagnostic services of the dentist, sometimes followed with restorative or other services. A decrease in the fee for a dental prophylaxis provided by the hygienist is expected to result in an increase in the demand for the diagnostic and restorative services of the dentist. This occurs because prophylaxes are usually provided together with oral examinations. The increase in restorative services results because the examination will detect needed therapy. That is one reason that individuals who have not visited a dentist for a considerable period are likely to have more untreated disease. It is in this economic sense that preventive services are complementary to examinations and therapeutic dental services.

Scope of services. The two previous concepts are related to the third concept of scope of services. The scopes of services the two types of practices can provide are markedly different. Except for certain services that require a specialist, a dental practice offers a broad range of services. This service scope creates a one-stop shopping environment. Alternatively, unsupervised dental hygienists are permitted only a limited range of services.

Some state practice acts allow hygienists to gather and assemble information that includes "oral inspection." While this allowance assumes some level of screening competence among hygienists, a thorough diagnosis is limited to the services of the licensed dentist. For this reason, for diagnostic services, the services of the hygienist and the services of the dentist are not substitutes but complements—that is they go together, when one occurs the other is likely to occur also.

Combining services. This is where combinations of services become important. For the patient, there is a benefit from the provision of preventive services and at least diagnostic services at a single sitting. When such services are provided together (bundled), the relation between the fee for the prophylaxis and the demand for diagnostic services becomes stronger than when

[2] Stiglitz JE. Economics. 2nd ed. W.W. New York: Norton & Company; 1993: 78-80, 268, 271-72.

unbundled.[3] That is, the complementary relation between the two services is greater when the two services are provided at the same "point of sale."

For the patient, there are clear advantages to the efficient combination of hygienist's services and the dentist's diagnostic services.[2] The patient is able to receive the services of the dentist and the hygienist in the same dental visit, thereby reducing the patient's waiting time, travel time and associated transportation expenses. The range of services that a practice can provide becomes important when the patient receives the services of both professionals. For the patient who seeks the services of the hygienist without the diagnostic services of the dentist, there are no economies of scope from the patient's point of view.

Economic Viability

One important economic question for this study is: Can unsupervised private dental hygiene practice be economically viable on a large scale? The second important question is: Can unsupervised private dental hygiene practice have a notable impact on access to care for the underserved?

The two questions are related. Unless unsupervised private dental hygiene practice is economically viable, it will not expand very much. To be economically viable, this mode of practice must provide hygienists with a competitive income compared to traditional hygiene practice, and patients must find the utilization of the services of unsupervised dental hygienists advantageous. Further, unless unsupervised dental hygiene practice expands, it cannot have a notable impact on access to care. No matter the laudable motivation, a small number of these practices can provide only a limited amount of services, compared to the needs of tens of thousands of underserved citizens of Colorado.

Tying the four economic concepts together forms the foundation for an assessment of both questions. The comparative fees for prophylaxes between unsupervised private dental hygiene practices and traditional hygiene services from dental practices are critical. Here is why. Together with the number of services provided, the fees of unsupervised dental hygienists are the source of income for the practice. The fee must be large enough to cover expenses or the practice will fail. Even if it does cover expenses, it must be high enough compared to the fees of the traditional hygienist to provide a strong incentive to establish an unsupervised private practice. This means the fee level in combination with the patient load must generate enough income to cover the increased expense of owning one's practice and still provide a competitive income.

However, if the fees of unsupervised practices are not lower than the fees of hygienists in dental offices, patients will not have an incentive to unbundle services that go together, such as prophylaxes and examinations. They will opt for the one-stop shopping with its built-in efficiency in time and effort.

Therefore, the fundamental operational question is: Are the fees of unsupervised hygienists lower than those of traditional hygienists? If they are not, then not many hygienists will have an incentive to establish unsupervised practices and not many patients will have an incentive to seek the services of the unsupervised hygienist in place of the services offered by a dental practice.

Methods And Subjects

Identification of Dental Hygienists

The Colorado Dental Association, the Colorado Dental Hygiene Association, the Colorado Department of Public Health and Environment were contacted to determine if they had a list of unsupervised dental hygiene practices. A list of unsupervised dental hygienist practices could not be located. Thus, a list of potentially unsupervised practices had to be developed. Once this list

[3] Carlton DW, Perloff JM. Modern industrial organization. 3rd ed. Reading, Mass.: Addison-Wesley; 2000: 379.

was developed, follow-up telephone contacts differentiated the original list of practices into those that were truly unsupervised and those that did not meet criterion described earlier. Two approaches were employed to locate dental hygiene practices that were possibly unsupervised.

The first effort was based on an examination of local telephone yellow pages throughout Colorado. A total of 24 hygienists and practices were tentatively identified as possibly unsupervised. Those practices were interviewed, and six practices were found to be unsupervised. Since a review of the yellow pages could have yielded an incomplete identification of unsupervised dental hygiene practices, further search methods were employed.

A second effort was based on a list of all actively licensed dental hygienists residing in Colorado. The list was obtained from the Colorado Department of Public Health and Environment and contained 2,702 individual hygienists with active Colorado licenses with addresses in Colorado. Telephone numbers were missing for 385 dental hygienists on the list. An additional 294 phone numbers and addresses were incorrect, and one hygienist was reported deceased.

The remaining 2,022 hygienists represent the list of eligibles for the study and attempts were made to contact them all. A total of 1,443 screening interviews were completed, resulting in a response rate of 71.4%. Only 105 hygienists refused to answer the questions and 474 could not be contacted after repeated phone calls at various times of the day and week. Table 1 displays the disposition status of the actively licensed hygienists.

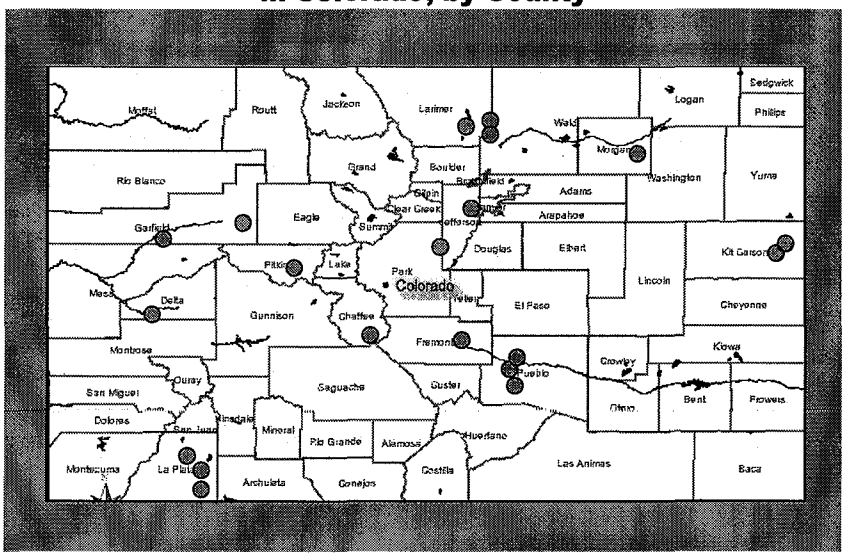
Of the 1,443 respondents to the initial screening survey, 28 were tentatively identified as possibly unsupervised. Subsequent telephone follow-up determined that only 16 were truly independent.

Table 1: Disposition Table

Total Number of Hygienists	2,702
No Available Phone Number	385
Disconnected or Incorrect Phone Number	294
Deceased	1
Eligible Hygienists Telephoned	2,022
Respondents	1,443
No Answer	474
Refusal	105
Response Rate	71.4%

The dental hygiene practices identified by both efforts were pooled and unduplicated. It was determined that 20 dental hygienists practicing in 17 practices were truly independent as defined in this paper. In Figure 1, the green circles illustrate the location of the 20 unsupervised dental hygienists.

Figure 1: Location of Unsupervised Dental Hygienists in Colorado, by County



Collection of Data from Dental Hygienists

Trained telephone interviewers conducted interviews with the respective contacts at each of the locations where possible. Calls were made during normal business hours in Colorado (Mountain Time). The first set of calls to hygienists identified using yellow page listings were made in April and August of 2004. The larger set of calls from the complete list of actively licensed dental hygienists were made in January 2005. A minimum of three, but often five, callbacks were made during each set of calls in an attempt to reach practices that did not respond to the phone rings. The telephone interviewers were directed to call back at different times or on different days.

For each hygienist, the telephone interviewer requested information regarding the availability of a dentist to check for any problems in order to avoid a separate visit somewhere else. The response to the question provided a basis for determining if there was a dentist in the practice at the time the hygienist was performing services. If a dentist was not available and a separate visit would have to be scheduled, then that practice was determined to be unsupervised.

Other key data collected from the practices of unsupervised dental hygienists included the following elements:

- Fee charged for adult prophylaxis.
- Fee charged for child prophylaxis.
- Length of time to get an appointment.
- Provision of radiographs.
- Location and ease of access to practice.
- Hours/days during which the practice is open.
- Repeat care with same hygienist—the patient returned to the hygienist for continuing preventive services.

The fee charged by unsupervised hygienists affects their ability to attract patients and earn an acceptable income. Together with the number of patients, the fee charged determines the practice revenue. As explained earlier, in a competitive marketplace, it would be difficult for an unsupervised dental hygiene practice that charges fees greater than those of hygienists affiliated with the neighboring dentists to compete for patients because most patients will choose the less expensive care with the dentist where they can receive the full range of services they may require.

Waiting time for an appointment and practice hours (measured both as the number of days per week and the number of hours per day the practice is open) are two indicators of the patient's ease of access to the unsupervised hygienist. These two variables also relate information about the work level of the unsupervised hygienists.

Taking on-site radiographs by unsupervised hygienists tends to reflect the extent of services provided. It also indicates the extent of investment by the hygienist in dental equipment in addition to chairs, lights and instruments. Hygienists leasing space from a dental practice likely did not make such an investment in equipment. To that extent, those practices are subsidized.

The location of the unsupervised hygienist and ease of finding the practice tend to reflect the ease of access by patients but also may reflect the nearness of the practice to other dentists and other practices. None of the unsupervised dental hygienists' practices were in difficult-to-find locations.

Collection of Data From Private Practice General Practitioners

As part of the assessment of the unsupervised practice of dental hygiene, we also collected similar information from dental offices located near the dental hygiene practices. Using data from the ADA's latest edition of *Distribution of Dentists in the United States by Region and State*,[4] all private-practice general

[4] American Dental Association, Survey Center. Distribution of dentists in the United States by region and state, 2002 (dataset). Chicago: American Dental Association; 2004.

practitioners in Colorado were identified and then located (or mapped) across the state.

Each hygienist or hygienist practice with the potential of being unsupervised was located by longitude and latitude. All private practice general practitioners were also located by longitude and latitude.

With specialized mapping computer software, market areas were defined by centering each market area around each hygienist or hygienist practice. Formed as circles, the radii were increased until a minimum of 10 neighboring dentists in rural areas and 20 neighboring dentists in urban areas were identified.

The number of dentists in each market area varied since increasing the radius of a circle often identified groups of dentists located near one another. Each dentist within a defined market area was contacted in order to complete the dentist survey portion of the study. A total sample of 384 dentists were selected and contacted, and 279 (or 73%) provided data.

Data were gathered from dentists prior to final classification of the potential independent dental hygienists. Once *tentatively unsupervised* dental hygienists were classified as *truly independent*, only the information gathered from dentists surrounding those truly independent dental hygienists were used for data comparisons.

Nearby dentists were included in the study for comparison because fee variation within the state of Colorado is substantial. By limiting the comparisons to hygienists and dentists in the same locations, often within a few blocks of one another, we were assured that the fees of both represented the same market conditions.

The telephone survey of the dentists included the following elements:

- Weekly office hours.
- Length of initial wait for an appointment.
- Usual wait to see a dentist after the patient has arrived for a scheduled appointment.
- Fee for an adult prophylaxis (CDT-4 procedure code D1110).
- Fee for a child prophylaxis (CDT-4 procedure code D1120).
- Whether the practice employed a dental hygienist.
- Whether the responding dentist was aware of any independent or unsupervised hygienists practicing in his or her community.
- Whether the responding dentist had received any referrals from independent or unsupervised dental hygienists.
- Whether the dentist regularly received referrals from independent or unsupervised dental hygienists.
- If responding dentists indicated being aware of independent/unsupervised hygienists practicing in their community, they were asked to provide any particulars such as name, location/address, phone number and so forth.

The most important comparison variables are the fees for adult and child prophylaxes. Their relative levels are critical to the test of our economic model.

Dentists were also asked about their office hours per week and the wait time for an appointment in order to make comparisons with the data reported by the unsupervised dental hygienists. Longer waits can mean hassles for patients. They are also an indication of the busyness of the practice.

Interviewers asked the dentists to indicate if they were aware of any unsupervised hygienists practicing in their community and whether they received patient referrals from those hygienists. This information provided the means of crosschecking the hygienist survey results regarding their reported dentist referral patterns.

As a final attempt to identify unsupervised dental hygiene practices, interviewers asked dentists to provide location information if they were aware of unsupervised hygienists in their community. This information served also as a rough indication of the extent of interaction between the two types of practices.

RESULTS

Selected Characteristics of Counties Where Unsupervised Hygienists Were Located

Figure 2 displays the location of the unsupervised practices (red circles) on a map with the projected 2005 average household income by 5-digit ZIP code. The map is color-coded by level of income. As the figure indicates the unsupervised hygienist practices are located in largely affluent and middle-income areas. Few are located in lower income ZIP codes and none are located in ZIP codes with the lowest average household incomes.

In Colorado, the Hispanic population is the largest minority group. Significant portions of this group are economically disadvantaged. Figure 3 shows percentage distribution of the Hispanic population in Colorado by ZIP code on a continuous color scale from 0% to 90%. The darkest green areas represent ZIP codes with the highest percentages of Hispanics, whereas the lighter areas represent ZIP codes with the lowest percentages. (The red circles indicate the location of unsupervised dental hygienists.)

Figure 2: Location of Unsupervised Dental Hygienists in Colorado, by Income Distribution

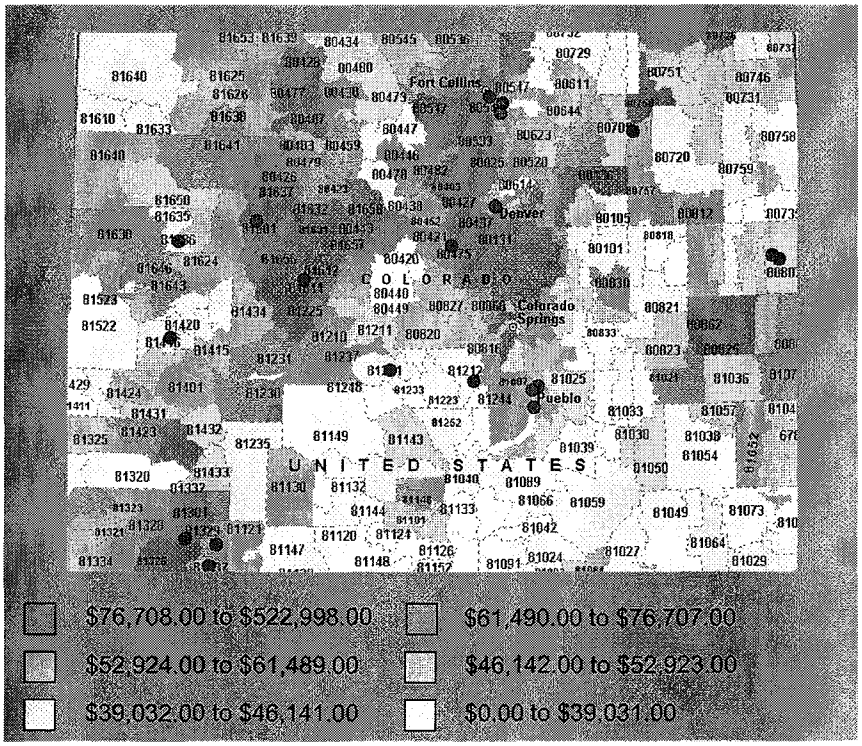


Figure 3: Location of Unsupervised Dental Hygienists in Colorado, by Distribution of Hispanic Population

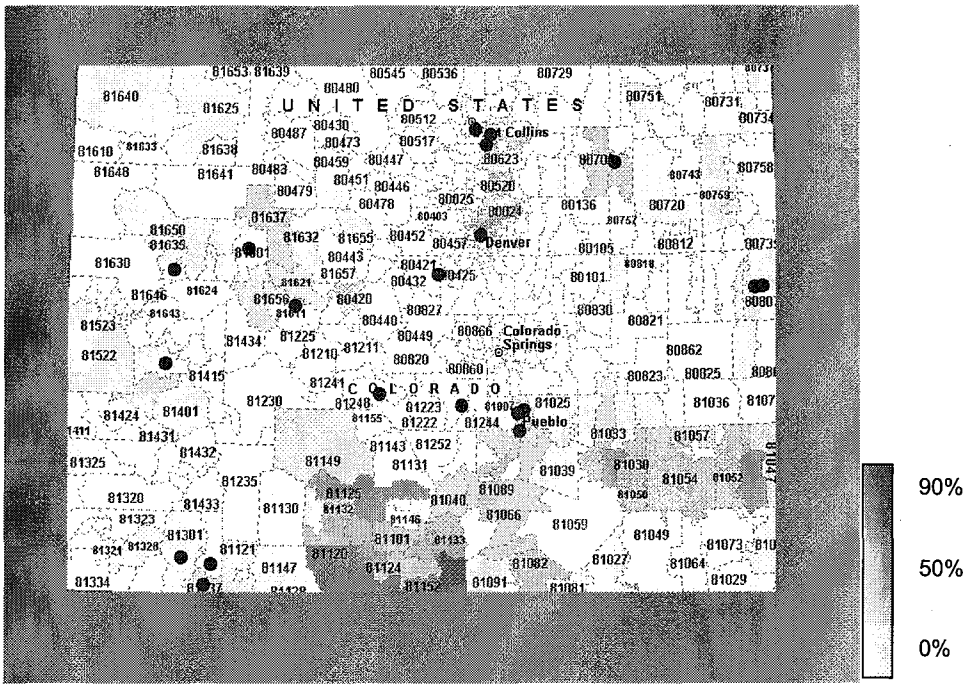


Figure 4a illustrates the locations of unsupervised dental hygienists in relation to Colorado counties that HRSA (Health Resources and Services Administration) designates as shortage areas.[5]

The unsupervised hygienists are indicated with green circles. Areas that are shaded in gray represent entire counties designated while those that are shaded with horizontal lines represent counties in which only part of the county is designated as a shortage area.

According to HRSA, when the entire county has an overall adjusted dentist-to-population ratio at or below the level set for designation as a shortage area, it is assigned a Whole County Dental Shortage Area Designation. If only part of the geographic area of a county is designated, then it is assigned as a Part County Dental Shortage Area Designation. The designation can be based on two different criteria:

- Geographic Designation: Census Tracts within the county have an adjusted dentist-to-population ratio at or below the level set for designation as a shortage area.
- Population Designation: Areas of the county, usually census tracts, with 30% or more of the population at or below the poverty level use a different adjusted dentist-to-population ratio. Parts of counties designated on this basis meet this second dentist-to-population threshold.

Figure 4a: HRSA Designated Dental Professional Shortage Areas in Colorado

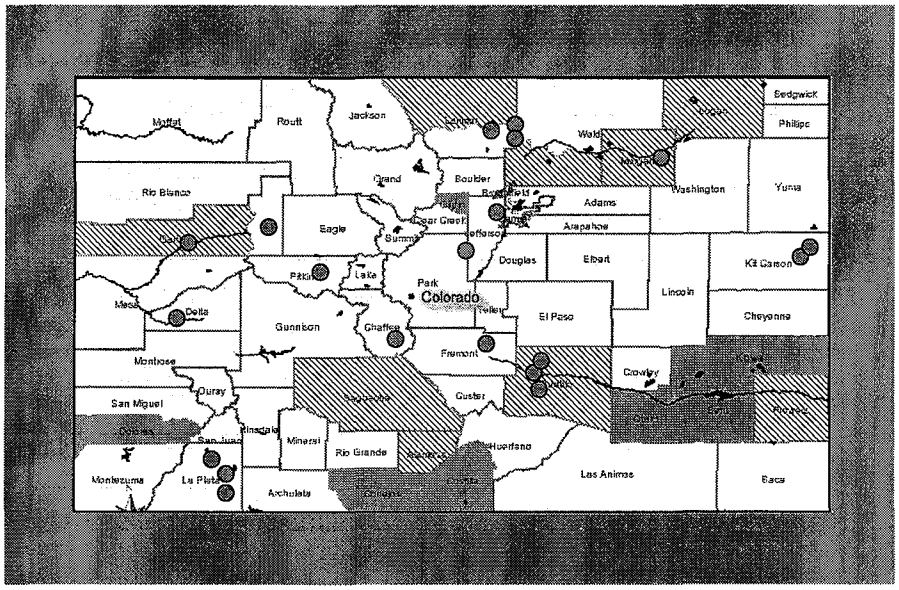
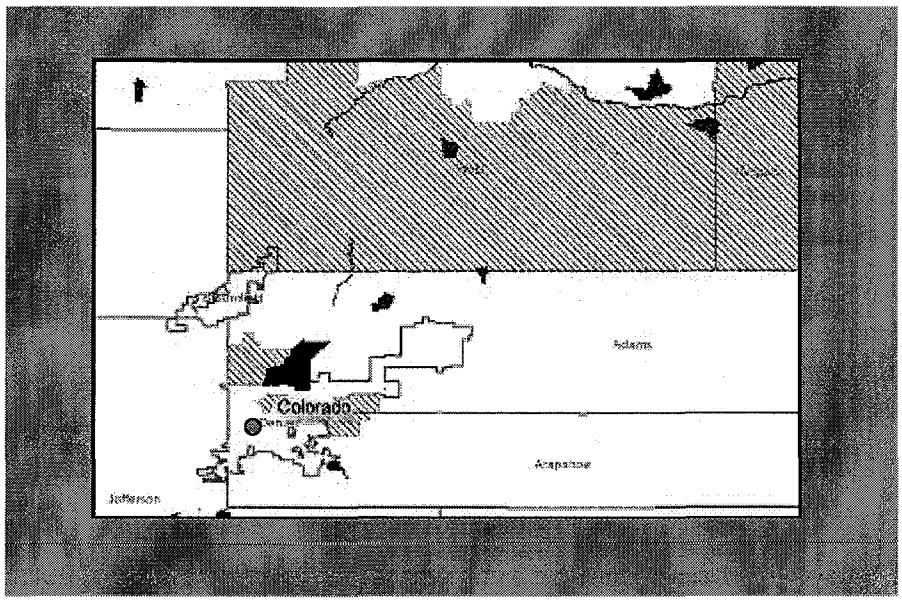


Figure 4b: HRSA Designated Dental Professional Shortage Area – Denver County



[5] U.S. Department of Health and Human Resources, Health Resources and Services Administration. HRSA Geospatial Data Warehouse. Available at: "Countyhttp://datawarehouse.hrsa.gov/DWOnlineMap." Accessed Jan. 20, 2005.

Most of the unsupervised hygienists are not located in designated shortage areas; five are located in partially designated counties.

The practice in Denver may be close to facilities or populations that are designated as having dental shortages. Figure 4b shows a closer look at the Denver County borders and the shortage areas within and close to Denver as designated by HRSA. About three sections within this area are designated as a "partial areas" (shaded in backward diagonal lines). However, none of the independent hygienists are located within these areas.

Analysis of Fee Data

Of the 17 unsupervised dental hygienist practices, sufficient fee information was obtained from 13 practices. All 13 practices provided fees charged for adult patients, and 12 practices provided fees charged for children. These fees were compared to fees charged among neighboring general practitioners in private practice.

For each unsupervised hygienist practice, a group of dental practices were assembled. Among dentists located near the unsupervised dental hygienists (who reported fees), 181 reported fees from which comparisons with unsupervised hygienists' fees could be made.

The method of analysis is based on the comparison between a single unsupervised hygienist practice and the neighboring dental practices. As a measure of dentists' fees among neighboring dental practices, the mean dentists' fee was calculated for comparison. For each unsupervised hygienist practice, the difference between the hygienist's fee and the mean dental practice fees was calculated, combined with the standard error of the dentists' fees. In particular, the following t-statistic was calculated:

$$t = \frac{F_H - F_D}{SD * (1 + 1/n)^{1/2}}$$

where F_H represents the hygienist's fee, F_D represents the mean of the dentists' fees, SD represents the standard deviation of the dentists' fees, and n represents the number of dentists. For each unsupervised hygienist practice, a t-value was calculated and compared to the appropriate statistical tables for the determination of statistical significance. These calculations were completed for both the adult and children's fees.

These results indicate considerable variability in unsupervised dental hygienists' market areas. Variability in dentists' fees is exhibited also between markets and to a lesser extent within market areas.

Table 2: Adult Prophylaxis Fee Analysis

Practice	t-value	Probability	Significance
A	1.000	0.341	Not Significant
B	1.828	0.209	Not Significant
C	2.799	0.014	Significant
D	0.455	0.655	Not Significant
E	0.129	0.899	Not Significant
F	1.080	0.293	Not Significant
G	0.850	0.413	Not Significant
H	0.120	0.907	Not Significant
I	0.771	0.484	Not Significant
J	1.304	0.249	Not Significant
K	2.520	0.040	Significant
L	0.507	0.626	Not Significant
M	1.684	0.143	Not Significant

Fees for adult prophylaxis. Table 2 presents the analysis of the adult fee calculations.

The results indicate that there are two market areas (C and K) in which the adult fee from the unsupervised hygienist practice is significantly lower than the mean fee from the neighboring dental practices ($p < .05$). Statistically significant differences were not observed among the remaining eleven market areas.

Note that multiple tests of significance can result in an increased chance of a false positive. That is, a statistical test may indicate that the two fees compared are significantly different when, in fact, they are not. If 20 separate tests were performed at the 5% alpha level, 1 in 20 of the results would be significant by chance alone.

To assess the overall differences between all market areas, an overall statistical test was constructed by summing the

negative natural logs of the probabilities, multiplying by two, and comparing this statistic as a Chi-square statistic.[6] The value of the calculated Chi-square statistic equals 34.77 and fails to exceed the Chi-square critical values at conventional tests of statistical significance.[7] Overall, one cannot conclude that hygienists' fees for adults are significantly different than the mean dentists' fees for adults.

Fees for child prophylaxis. Table 3 presents the evidence from the comparisons between fees for children.

Table 3: Child Prophylaxis Fee Analysis

Practice	t-value	Probability	Significance
B	9.650	0.011	Significant
C	4.792	0.001	Significant
D	0.486	0.634	Not Significant
E	0.240	0.814	Not Significant
F	0.901	0.378	Not Significant
G	1.566	0.146	Not Significant
H	0.079	0.938	Not Significant
I	0.577	0.622	Not Significant
J	1.905	0.115	Not Significant
K	2.259	0.058	Significant
L	1.383	0.204	Not Significant
M	0.279	0.789	Not Significant

For the children's fee calculations, there were three market areas (B, C, and K) in which the calculated t-value is statistically significant using a significance level of p = .05. Interestingly, in two of these markets the hygienist fees were greater than the mean of neighboring dental practices, and in one market the hygienist fee was less.

For the remaining nine market areas, one cannot detect a difference between the hygienist's fee and the mean of the neighboring dentists' fees.

To assess the overall differences between all market areas regarding child prophylaxis fees, the same type of overall statistical test was constructed as described in the analysis of adult fees. The results indicate that overall, there is a statistically significant difference between unsupervised hygienists' fees for children and the mean of neighboring dental practice fees.[8] Since this significance results because of three markets, and since the differences in the three markets are not in the same direction, one cannot determine the direction of the overall effect. Thus, it is not justified to conclude that unsupervised dental hygienist fees for children are lower.

Other Practice Characteristics of Unsupervised Dental Hygienists

In addition to prophylaxis fee data, both hygienists and dentists were asked about several other practice characteristics that are presented in the following sections.

Referral to practicing dentists. In response to the question, "Is there a dentist there who can check for any problems so we don't have to schedule a separate visit somewhere else?" All of the unsupervised hygienist practices indicated that there were no dentists on site who would take care of any problems at that time. Regarding referrals, seven of the 14 responding practices indicated that they refer patients to dentists if any problems occur or are detected.

From the dentist telephone survey, dentists were asked if they were aware of the presence of any independent or unsupervised hygienists practicing in their community. Almost 64% of the respondent dentists were not aware of their presence. Thirty-nine percent of the dentists who said they were aware of unsupervised hygienists also said they had received a referral sometime, but only 12% said they received referrals regularly. Together, these findings suggest that

[6] See B. J. Winer, *Statistical Principles in Experimental Design*, McGraw-Hill: New York, 1962, pp. 43-45.

[7] The 34.77 is compared with 26 (2 times the number of t-values) degrees of freedom.

[8] The calculated Chi-Square equals 44.135 which is statistically significant at the 1% level of confidence.

interaction between dentists and independent hygienists is not extensive, either because hygienists see only a few patients in the area or that they focus their relationship with only a few dentists.

Length of time to appointment. Unsupervised hygienists also were asked, "How long does it usually take to get an appointment?" Among the eleven unsupervised hygienists who responded to this question, four reported that it required less than a week for an appointment while four indicated it took a week to get an appointment, and three reported it took two weeks. The mean length of time until appointment was 7.7 days, and the median was 7 days.

Among the general practitioners surveyed in the same communities as the unsupervised hygienists, about 25% reported that patients could make an appointment for one week or sooner. Forty-two percent reported that the appointment wait was greater than three weeks. Among the responding general practitioners, the mean wait for an appointment was 29.9 days and the median wait was 14 days. A statistical test of the differences in mean appointment waiting times ($p = .05$) failed to detect a statistically significant difference—that is, it cannot be concluded that the mean waiting time for an appointment with independent dental hygienists and dentists are different.

While not statistically significant, unlike fees, the difference is substantial and merits some explanation. The shorter wait time for an appointment with an unsupervised private dental hygienist practice would be attractive to the patient. They could see the dental hygienist more quickly. However, for the hygienist, it would suggest that their appointment schedules are less busy than those of local dentists.

Hours and days the practice is open. In response to a question of, "What are your hours?", five of eight hygienists responding reported that they were open eight hours on their workdays. Only one of the respondents reported less than eight hours and no one reported more than eight hours. There was some variation regarding the number of days and the pattern of days the practices were open. The number of days open ranged from 2 to 7 days with a mean of 4 days and a median of 4 days.

The number of hours that hygienist practices were open per week was based on the number of hours open per day and the number of days open per week. Total hours open per week for the responding hygienists ranged from 8 to 40 hours. The mean number of hours open per week was 25 hours and the median number of hours was 28 hours.

Among general practitioners responding to the dentist survey conducted in the same communities as the unsupervised hygienists, the number of hours the practice was open ranged from 8 hours per week to 66 hours per week. The mean number of hours the practices were open was 35.7 hours and the median was 36 hours per week.

Use of radiographs. In order to gauge the extent of services provided by unsupervised dental hygienists and their investment in dental equipment in addition to chairs, lights and instruments, they were asked if they provided radiographs. All but two of the seventeen unsupervised hygienists who responded to this question reported they provided radiographs in their practice.

Discussion

The results of the fee comparison confirm what is suggested by the relatively few number of unsupervised private dental hygiene practices. Patients are not able to realize significant saving from unbundling the services of the hygienist from those of the dental office. Hygienists and dentists in dental practices are able to provide preventive services at comparable fees. This works to the disadvantage of unsupervised private hygiene practice because as economic theory explains, their fees would need to be lower to make up for the disincentive that patients encounter from the need for two separate visits to health professions.

These analyses suggest that independent dental hygiene practice in Colorado is very limited because that practice model does not offer a more efficient model for the delivery of preventive dental services over traditional dental hygiene practice. In addition, the model does not generate substantial economic incentives for dental hygienists to undertake the business risk of opening an independent practice. Economic theory instructs that where the economic incentive of a business model is apparent, instances of that model will expand. This has not happened for independent dental hygiene practice in Colorado.

Since unsupervised hygienists' fees are not lower, the incentive for the hygienist to establish a private practice with the attendant investment requirements and business risk is very weak. If a hygienist can earn as much working in a dental office, that type of practice offers several advantages. Those in traditional practice do not have to worry about running a business. If snow shuts down the office, they are not the ones who will pay the staff for a day generating little revenue. They are not the ones who will have to negotiate the lease and replace obsolete equipment. They are not responsible for collecting accounts receivable.

Of course, some hygienists may prefer their own practice for personal reasons. They are the ones we observed in this study. Their own practice may provide a sense of independence. Each is his or her own boss. These features are reasons that attract dentists to the profession, as well. However, if the financial attractiveness of dentistry disappeared, those features would soon lose their desirability for the majority of dentists, and likewise, for the majority of dental hygienists.

For all of these reasons, the business viability of independent hygienists is questionable since they must compete with dental practices that have the advantage of full economies of scope. The very small number of truly independent practices in the State of Colorado is further indication of questionable business viability.

Unsupervised private dental hygiene practice, as defined in the study, has not had a notable effect on access to care in Colorado. The reason is that the number of unsupervised hygienists is very limited, even after almost two decades during which unsupervised dental hygiene practice has been permitted in Colorado.

The 20 unsupervised dental hygienists identified in this study practiced an average of 25 hours per week. The total hours of care provided by these hygienists is estimated at about 500 hours per week. That amount of practice time is too small to have a material impact on access to dental services by any particular subgroup in Colorado.

In contrast, there were nearly 2,100 dentists practicing in Colorado in 2004. Using the average of 35.7 hours per week that responding dental practices were open, the total hours of care provided by dentists in Colorado is estimated to be approximately 74,970 hours per week.

Furthermore, the practices of the unsupervised hygienists were located primarily in areas with household incomes substantially above the average. Five of the unsupervised dental hygienists were located in counties identified by HRSA as partially designated shortage areas. However, only one practice was located in a low-income area of a partially designated county; the other four were located in high or middle-income areas of the designated counties.

It should be noted that even in affluent neighborhoods, a portion of patients in either a hygienist's or a dentist's practice could be disadvantaged. Nevertheless, even if unsupervised dental hygiene practices were focused completely on care for the disadvantaged, their impact on access to care for the disadvantaged would remain limited because lack of business viability translates into few individuals and limited hours providing care.

Occupational Restrictions and the Quality of Service Received: Some Evidence*

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I. Introduction

Advocates of occupational licensing have been so successful with legislators that currently more than eighty occupations are licensed or restricted at some level of government. The majority of these occupations are licensed in most states with as many as sixty occupations licensed in a single state [7].[1] As of 1969, ten percent of U. S. national income originated in occupationally restricted labor markets.[2] Licensed occupations hold a strategic position among all occupations in that they include all traditional professions and most skilled trades. Restrictions on number of practitioners are often imposed by such methods as licensing, limiting training facilities and imposition of union strictures.

Occupational licensing regulation exists primarily at the state government level; however, significant restriction also occurs at national and municipal levels. The rationale of such regulation, at least as presented to legislative bodies, is that it raises the quality level of services for two explicit purposes. First occupational regulation provides a standard by which professional competence may be judged helping to avoid negative third party effects which may result from incompetent practitioners; for example, licensing of Certified Public Accountants is, in part, rationalized as protecting investors who must rely on the accuracy of financial information produced and verified by accountants who are neither selected by, nor responsible to, the investors. The second purpose of such regulation is to provide a higher standard of quality; consumers are believed to be unable or unwilling to correctly evaluate

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1. In California alone, 61 varieties of construction construction contractors' licenses are required by state laws. Dade County, Florida requires some eighty licenses in a variety of construction occupations [20].

2. Based on 1970 census data for the following occupations: insurance agents and brokers; accountants; architects; engineers; lawyers and judges; salesmen; hairdressers and barbers; primary and secondary school teachers; carpenters; electricians; masons; plumbers; surveyors and draftsmen; therapists.

quality standards, and therefore perpetrate situations in which low quality service (perhaps at lower prices) drives higher quality (higher prices) service out of the market. Thus, it is argued, occupational licensing laws excluding "low quality" producers are in the public interest because they provide the consumer with the type of service a sufficiently informed or motivated user would choose. A person may unknowingly retain an incompetent attorney or physician whose services result in severe damage that cannot be adequately compensated by ordinary judicial remedies; the assumption is that had the consumer been able to judge correctly the quality of the service beforehand, he would not have procured it.

In practice, most occupational licensing laws attempt to increase the quality of inputs (qualifications of entrants into the profession or trade) in the belief that this will alter the quality of services actually received by the consumer. However, it is not at all clear that even a successful upgrading of inputs leads to a necessary increase in the quality of *service actually received by the consumer.* Indeed, quite the opposite may occur. It is this question we specifically address.

There has been scant empirical work directly relating occupational licensing to its effects on service quality. Theoretical analyses of a general nature have been published by Friedman and Rottenburg [9; 8; 18]. In general, these sources view licensing as a form of monopoly created by entry restrictions and analyze its implications within that framework. Friedman, however, conceptually examines the impact of this entry restriction on the quality of services actually received by consumers [8, 155-7]. Several of Friedman's arguments are summarized next.

There are at least four ways in which restrictive licensing may lower the quality of services actually received by consumers. First, when restrictions are imposed and a smaller total supply of service results, some consumers will turn to substitutes of lower quality. Substitutes can be nothing more than "do-it-yourself" services possibly coupled with untrained advice or assistance. In some instances the substitute is simply no service at all.

Second, licensees can be asked to perform tasks for which they are over-trained. Considerable time may be devoted to services that could be performed equally well by persons of lesser training; however, restrictive regulations prohibit such action. This dilutes the average skill content (quality) of services actually received by consumers from the stock of skills within the occupation. In the absence of these limitations, highly trained persons could devote a larger proportion of their time to tasks in which they specialize, thus utilizing their skills more efficiently.

Third, the relevant concept of quality is a function of both skill content and quantity of service. Thus, even if the skill content received by consumers could be increased by restrictions, the quantity of service may reduced, and the net result can be detrimental if the quantity reduction more than offsets the skill increase. For example, the state of one's health is a function of both the skill and the availability of physicians. If restrictive licensing sufficiently reduced the frequency of consultation, the result could be both the presence of highly qualified physicians and a declining state of average patient health.

Not mentioned by Friedman is a fourth possibility. In competitive industries firms are forced to compete qualitatively as well as with price. If licensing restricts competition among professionals, then it might lessen competitive pressures to compete on quality.

Public debate on occupational restriction is concerned more with the formal qualifications of practitioners than with the quality of service actually received by consumers. That formal qualifications are easier to observe than service quality is no excuse for ignoring the latter, which is of more concern of consumers.

From the public policy point of view, occupational licensing is administered by those regulated [21; 35]. The majority of regulatory bodies created to administer the licensing laws are controlled either directly or indirectly by the licensed occupations or industries themselves; obviously, this produces a potential conflict of interest. Moreover, unlike most traditional forms of regulation, occupational licensing laws rarely make any attempt to control or regulate such potentially undesirable side effects of entry restriction as monopoly pricing, reduced quantity of service, discrimination and/or favoritism among entry applicants, pressure for conformity among practitioners, and restrictions on the growth of human capital.[3]

This investigation marshalls exploratory evidence regarding the effect of licensing on the quality of received service. The primary argument supporting occupational licensing laws has been that such regulations result in improved service quality.[4] It is this argument alone that classifies such legislation as "public interest" instead of "special privilege." Evidence on this issue is directly relevant in any comparison of the social benefits and costs of licensing legislation.

II. Procedures and Methodology

This paper deals exclusively with restrictions at the state level and confines itself to cross-state statistical comparisons. While local licensing is of some importance, it is beyond the scope here. The two data classes of particular interest (and yielding the most difficulties) are (1) the types of restrictive provisions instituted by the relevant authority and (2) realistic, reasonable, and available proxy measures of *quality* of service received.

Most provisions of licensing boards, i.e., qualifications which must be demonstrated in order to be licensed, *could* be used for restricting the number of practitioners and enhancing income in the licensed fields. Some of these are passrates on licensing examinations, residency requirements, citizenship requirements, educational hurdles, apprenticeship terms, character provisions, and the like. All of these and many more including restricting vital educational facilities could conceivably be used to significantly restrict entry into a field and thus affect quality in one way or another. Which of these, if any, are actual constraints for a particular profession is strictly an empirical matter.

Quality measure is the nub of this investigation and its thorniest problem. By its nature a statistical measure of quality must be an empirical proxy. Proxies fall into at least the following general categories:

Substitutes for licensed services. Restricted labor markets and monopoly pricing induce some consumers to replace licensed labor with lower quality substitutes, especially "do-it-yourself" services. A statistical measure of such substitute activities could in some cases be expected to have a negative relation with the average quality of services actually received when the concept of service includes both purchased services and own services. Some potential candidates for this type of measure include retail sales of home electrical repair equipment (electricians), retail sales of non-prescription drugs (physicians), and retail sales of hair cutting equipment (barbers).

3. The recent flurry of antitrust suits aimed at professional organizations of physicians, accountants and professional engineers as well as consumer movements challenging traditional complacency among professionals in policing their own ranks are bringing changes [36].

4. Not under consideration here is the type of legislation which is intended to insure ethical and/or honest performance of a specific job once one is in the business. These are typically business-type regulations which relate to legal liabilities, rules and regulations involved in operating businesses and are not considered here to be occupational restrictions.

Distribution of service among income groups and geographical locations. The more highly concentrated is existing service to particular income groups or geographical locations, the lower, it is hypothesized, will be the quality of service to the public at large. For example, few persons of low or even middle income are able to consult trained psychiatrists. Physicians and dentists, in general, are concentrated in urban rather than rural areas.[5] A similar situation occurs for licensed skilled trades. One would expect to find that the lower the restrictive barrier to entry, the wider will be the distribution of trained persons, thus the broader the availability of services.

Duration/frequency measures of service. This is a measure of supply relative to potential demand. More precisely, the measure could be defined as maximum minutes of services per capita or, perhaps, as a calculation of frequency of a stated amount of service per person in the population. This measure assumes that the more time per capita available, or the more frequent potential service, the higher is the quality of service. A priori, we would expect that the more restrictive entry would lower this measure of quality.

Quality level of the stock of goods serviced. Many licensed occupational services are directed toward maintenance of given "stock of goods" such as housing or safety of automobile transportation; medical services are desired primarily to maintain one's "stock of health." Variations in the quality of such stocks can be systematically related to the quality of the flow of services maintaining them. For example, if it were found that the percentage of substandard housing was positively related to the degree of restriction in the building trades, other things being equal, it could be argued that restrictions contributed to the decline in quality of housing maintenance. Similar research on health levels or other stock measures would seem to be potentially fruitful.

Stock of training/experience. Larger stocks of accumulated experience and training may be positively related to higher average quality, and both may be expected to be inversely related to the degree of entry restrictions. For example, the age distributions of licensees can imply varying levels of accumulated experience.

The occupations studied below are mainly the result of winnowing scores of occupations for usable, extant state by state quality proxies [5]. One of the chief problems was the existence of fields in which even conceptually it was hard to imagine a proxy for quality that would be definable. How, in fact, would one measure the quality of service rendered by architects, psychologists or landscape architects? The services rendered are either measured by the taste of individuals or so intertwined with other activities as to be not independently measurable. A second reason for disqualification was unavailability of quality data of any type. Under this rubric fell the chiropractors and others. Other professions were purged for being in unambiguous and longstanding excess supply, such that licensing had no restrictive or limiting effect. Under this heading could be placed school teachers, cosmetologists, and barbers.[6]

The denouement of the selections process is a group of seven rather diverse occupations. They are as follows: electrictions, dentists, plumbers, real estate agents, optometrists, sanitarians, and veterinarians. For the first three rather detailed results are presented.

5. Of 193,000 dentists in the U.S., 100,000 practice in large urban areas [24]. The same pattern holds true for doctors [13].

6. Confirmation of this excess supply phenomenon is given by Thornton and Weintraub, [23].

III. Electricians

The analysis employed for electricians illustrates the general procedure used to investigate the restriction-quality interconnection. Two equations are estimated as a system. One has as its dependent variable some measure of per capita numbers of practitioners—called density here—as a function of restrictiveness and licensing variables as well as other things. The dependent variable in the second equation is the proxy for quality as a function of estimated "density" and other relevant independent variables. This essentially recursive system is estimated with three stage least squares. The first equation in Table I has as the dependent variable the number of journeymen electricians per kilowatt hour (density) of residential and commercial electrical consumption.[7] The second equation then estimates the number of accidental deaths by electrocution per kilowatt hour consumed as a function of the density of electricians. It is in the first equation that licensing restrictiveness influences are entered while general control variables appear in both equations. Table I displays the results of this estimation technique. A requirement for prior occupational experience for journeymen electricians in the first set of equations and an oral exam as a part of the testing procedure in the second set is used as the licensing restrictiveness measure. The first equation in each of the two equation sets consistently displays coefficient signs which reflect the expected effects of supply restrictions whether in the form of licensing laws or via union practice. However, only state income and experience requirements are statistically significant by common standards in the first set. One reason for the lack of clearer relations in the remaining variables may be our inability to control for widely varying degrees of local licensing restrictiveness in states that have no state licensing requirements. This problem is particularly relevant to the lack of statistical significance of the licensed/unlicensed variable.

The second or "quality" equation is perhaps the more interesting in its implications. Plainly stated, the fewer the toal number of journeymen electricians the higher the number of accidental deaths by electric shock per kilowatt hour of non-industrial electricity consumption. Attempts were made to obtain other proxies for the quality of service received by consumers (e.g., fires of electrical origin) but paucity of data prevented their use.

In the second equation set the same estimating method is used. The single difference between the two systems is that the licensing variable used in the second set is whether or not the state requires an oral examination to be taken to obtain a journeyman's license. This variable is obviously playing a restrictive role on the density of electricians and a highly significant influence as well. Again, the evidence supports the findings that restrictions that reduce the density of electricians are significantly associated with a rise in the rate of death from accidental electrocution.

Numerous licensing requirements such as schooling, skill testing, and age limitations were tested, but none revealed the degree of significance of the two reported requirements; however, most had the expected negative coefficient sign. It could be argued, a priori, that per capita state income, the proportion of rural households and the proportion of owner-occupied residences may alter the propensity for consumer substitution away from licensed electricians and consequently affect the observed accidental death rate. However, regressions

7. Density was also measured by total electrical consumption as an alternative to only residential plus commercial consumption. The statistical results were mixed by comparison to Table I. Moreover, their interpretation is uncertain due to large variances in industrial consumption of electricity across states and the nature of the relationship of industrial electrical usage on the firm's derived demand for electricians.

Table I. Three Stage Least Squares Estimates of a Recursive Equation System: Electricians

	Intercept	Density of Electricians	Density of Pre-1939 Houses	Electricians' Median Earnings	Per Capita State Income	Percent of States' Electricians Unionized	Percent of Electricians Working 50 to 52 Weeks	State Law on Electricians Licensed/ Unlicensed	Licensing Restriction
Licensing Restriction: Prior Occupational Experience; Data: Journeymen Electricians; Date: 1970; Number of Observations = 50									
Density of Electricians =	0.39*			-0.001	0.01	-0.02		-0.05	-0.23**
	t=1.9			t=-0.7	t=2.1	t=-1.2		t=-1.1	t=-2.1
Density of Deaths =	0.04**	-0.66	0.017						
	t=2.8	t=-2.2	t=1.2						
Licensing Restriction: Requirement for Oral Examination; Data: Journeymen Electricians; Date: 1970; Number of Observations = 48									
Density of Electricians =	0.584***			-0.001	0.005	-0.02		-0.04	-0.33***
	t=3.5			t=-0.7	t=1.0	t=0.9		t=-1.2	t=-3.0
Density of Deaths =	0.07***	-0.12***	0.03						
	t=3.6	t=-2.7	t=1.0						
Data: All Electricians; Date: 1950; Number of Observations: 48									
Density of Electricians =	-3.83			-0.006	0.0168***		0.03	-1.2	
	t=-0.2			t=1.2	t=3.43		t=0.1	t=0.4	
Density of Deaths =	0.0048***	-0.0002*							
	t=7.7	t=-1.8							
Data: All Electricians; Date: 1960; Number of Observations: 48									
Density of Electricians =	0.051			-.0001	0.0002***		-0.0008	0.07	
	t=0.1			t=-1.0	t=2.7		t=-0.24	t=1.4	
Density of Deaths =	0.004**	-0.004*							
	t=3.3	t=-1.8							

Significance levels of two-tailed t-tests: * indicates 10% level; ** indicates 5% level, and *** indicates 1% level.

Notes: Density of electricians and deaths are measured per kilowatt hour of non-industrial electricity consumption (i.e., residential and commercial consumption). Median earnings are in dollars/100.

Sources and Data Definitions: See Appendix.

similar to those in Table I were tested with the above variables in the second or "quality" equations with the result being no material change in the nature or significance level of electrician density on death rates. Indeed, income per capita and owner-occupied variables were insignificant and the latter's sign was contrary to the above conjecture.[8]

Statistical results such as those for electricians should remind us again that association and not causation are indicated by regression analysis. In view of this—and because of the startling character of these results—many other specifications of the electrocutions equation were tried. Examples were ordinary least squares specifications with such variables as industrialization, urban mix, climate, and others singly and in combination. Despite this the result held robust for 1970.

State level licensing of electricians really became common only after 1960. Only five states licensed them in 1950 and only seven in 1960, but by 1968 twenty-one did so.[9] However, data on the proxy for quality are availbale for both 1950 and 1960. As is evident from Table I, the electrocutions—electricians results remain firmly in place over time.

Whatever the causal nexus, the system showed significant decreases in the density of electricians to be associated significantly with several restrictive measures (tests, experience requirements), and in turn increases in accidental electrocutions are associated with lower per capita availability of electricians.

IV. Dentists

For the dentists' case an essentially recursive system is estimated with three stage least squares. Restrictiveness and quality measures are the key, and dentistry provides a wealth of candidates for each. Six measures on licensing restrictions ranging from a requirement for U. S. citizenship to whether dental care specialists are licensed are available. Two forms of licensing requirements for dentists which appear to be significantly restrictive and which differ widely between states are citizenship and reciprocity requirements.[10] Quality proxies range from dentists' estimates of their own 'busy-ness' and service availability to direct measures of dental health such as edentulousness.

Estimates are presented in Table II using the existence of a citizenship requirement for obtaining a license as the restrictiveness measure. In all cases this variable is significantly negative at the 10 percent level. In the second equation five proxy measures of quality are used. Each could be interpreted as a different variant of a measure of dental availability. Thus, in equations 1 and 2 dentist density is negatively associated with feelings by dentists that they are too busy and positively with feelings they are not busy enough. More important, the next three equations tend to confirm that both long work weeks and long delays in seeing patients are significantly related to restricted numbers of dentists. That this may be indicative of more than inconvenience might be inferred from the "waits to over one month" result in equation set 5.[11]

8. As an additional test the impact of licensing master electricians on the density of all electricians per non-industrial kilowatt hour and on the death rate for accidental electrocution was examined. A comparison of the results with those reported here reveals the same basic pattern of effects as obtained for journeymen electricians.

9. States which licensed electricians in 1950 were Massachusetts, Michigan, Minnesota, North Dakota and Rhode Island. By 1960 Colorado and Wyoming had followed suit.

10. Pashigian has found that the non-existence of reciprocity is restrictive in effect [15].

11. Similar regressions were run with a reciprocity dummy replacing the citizenship requirement. Here a positive relationship between density and reciprocity indicated that reciprocal arrangements between states tend to increase practitioner density. Results here are broadly confirmatory of those for citizenship although perhaps not as strong. In particular very long waits for appointments are still associated with dentist sparsity.

Table II. Three Stage Least Squares Estimates of a Recursive Equation System for Dentists Using U. S. Citizenship as the Licensure Variable, and Fifty Observations

	Density Equation				Quality Equation				
Dentists = Per Capita	Intercept	Mean Earnings 1970	Dental Graduates 1970	Citizenship Requirement	Quality[a] = Measure	Intercept	Dentist Density	% of Population over 45	% of Population Floride
EQUATION SET 1									
	0.3020	0.0017	7.6965 **	-0.0772 **	Dentists	38.854 **	-71.188 ***	28.310	-0.0693
	t=1.461	t=0.262	t=2.221	t=2.4811	too busy	t=2.543	t=-3.41	t=0.556	t=0.636
EQUATION SET 2									
					Dentists				
	0.3158	0.0001	8.8506 **	-0.0628 **	Not busy	-10.215	66.6501 **	9.874	0.0496
	t=1.741	t=0.0968	t=2.69	t=-2.2492	Enough	t=-0.46	t=1.947	t=0.131	t=0.316
EQUATION SET 3									
					Hour Per Week				
	0.2784	0.0002	8.8976 **	-0.0637 *	In Patient	35.561 ***	-5.0378 **	3.5623	-.0134
	t=1.260	t=.264	t=2.503	t=-1.935	Contact	t=17.141	t=-2.3613	t=.527	t=.603
EQUATION SET 4									
					Appointments:				
	.2735	0.0001	9.4031	-0.0559 *	% Waiting	3.332	53.5234 **	-1.594	1.55
	t=1.378	t=.270	t=2.761	t=-1.859	3-7 Days	t=.209	t=2.3655	t=-0.030	t=1.3799
EQUATION SET 5									
					Appointments:				
	.2980	0.0001	8.6089 **	-0.0659 **	% Waiting	32.032 **	-57.631 ***	8.652	-0.0349
	t=1.5489	t=.216	t=2.561	t=-2.245	Over 1 Month	t=2.596	t=-3.1837	t=.2086	t=-0.40

Significance levels of two-tailed t-tests: * indicates 10% level; ** indicates 5% level, and *** indicates 1% level.
[a]All data except that for quality is for 1970. The correlation between dentists in 1970 and 1975 is .99.
Sources and Data Definitions: See Appendix.

The reciprocity effect can be investigated with a different set of data based on records collected by the Navy on Naval recruits in San Diego in 1969. A specification similar to the ones used above is shown in Table III. The dependent variable in the quality equation is an oral hygiene index constructed by the Naval Medical Research Command. In this system, reciprocity (lack of restrictions) increases density, and density is positively associated with good oral hygiene.

Some further evidence is available on the association between dental health and dentist density, although not relating to any specific restrictiveness measure.[12] Regressions using data gathered in interviews of over 100,000 persons from SMSAs in 22 states indicate that the smaller numbers of dentists per capita are associated with more widespread tendencies among those who own false teeth to never wear them, indicating, perhaps, that the dentures, for whatever reason, are not satisfactory.

In sum there is evidence that strong forms of licensing restriction such as the requirement for U. S. citizenship or the lack of reciprocity agreements between states are associated with reduced numbers of practitioners which in turn are associated with proxy measures for low quality dental care. Additionally, other evidence suggests low density numbers affect denture-wearing habits and are, perhaps, associated somewhat with increased edentulousness.

V. Plumbers

The proxy for quality of plumbing service received by consumers is quite different and not nearly so dramatic as that used in the analysis of electricians. The nature of the plumbing trade and data availability directed the choice of a proxy to a measure of the degree of substituting self-service plumbing for that of a licensed tradesman. Specifically, the quality of service measure is the dollar value of retail sales of plumbing supplies per house. This proxy assumes that the more stringent are the barriers the higher will be the cost of licensed service and the smaller will be its quantity. These two effects increase the motivation of consumers to substitute their own services for those of trained professionals. This substitution process should show up in rising *retail* sales of plumbing supplies in more tightly restrictive states since licensed plumbers will generally purchase supplies wholesale. The implicit assumption is this causal chain is that self-service is on the average of lower quality than could be obtained from even a marginally trained journeyman plumber.

The equations in Table IV are structurally identical to each other and differ only in the licensing variable that enters the "density of plumbers" equation. The expected restrictiveness sign for three of five variables (all entry barrier variables) is found in the first equation set. When the two income variables are considered, the sign and significance on the coefficient of plumbers' earnings probably reflects the expected supply response to higher occupational earnings. The second equation demonstrates a significant expected negative relationship between the stock of plumbers and retail sales of plumbing supplies.

The second set of equations using the requirement of a skill test is generally supportive of this evidence with some variables gaining or losing levels of statistical significance. Per-

12. Data on total edentulousness are available and show a consistently negative sign between toothlessness and dentist density, but not at a significant level in our formulations. Holen sometimes seems to find a significant relationship as in her Table 8, [10, 36].

Table III.

DRAFTEES EXAMINED AT THE SAN DIEGO NAVAL BASE, 1969; NUMBER OF STATES = 28

		Intercept	Per Capita Dentists	Per Capita Dental School Graduates, 1969	Reciprocity	Dental Earnings	Percent of Population Over 45	Percent of Population with Fluoride
Per Capita Dentists	=	0.0878 t=0.4877		10.9696*** t=3.3376	0.0822*** t=3.0703	0.000005 t=0.9502		
Oral Hygiene Index	=	0.6592* t=1.7121	0.9812* t=1.7234				0.7793 t=0.6061	0.0044* t=1.666

SMSA DATA: PEOPLE WHO OWN FALSE TEETH BUT NEVER WEAR THEM; NUMBER OF OBSERVATIONS = 22

		Intercept	Per Capita Dentists	Per Capita Enrollment in Continuing Education	SMSA Median Income	SMSA Median Years of Schooling	% of SMSA Population Over 65	Dental Specialists Licensed
Per Capita Dentists	=	-1.8100*** t=-2.63		0.0580 t=1.25	0.00008*** t=3.22	0.0926 t=1.85	2.8288*** t=3.14	-0.1990** t=-2.54
Patient Owns But Never Wears False Teeth	=	-8.0137 t=0.63	-25.6590** t=2.195		0.0011 t=-0.87		138.44*** t=3.50	-3.7571 t=2.05

Significance levels of two-tailed t-tests: * indicates 10% level; ** indicates 5% level, and *** indicates 1% level.
Sources and Data Definitions: See Appendix.

Table IV. Three Stage Least Squares Estimates of a Recursive Equation System for Plumbers

	Intercept	Density of Plumbers	% of Houses Fully Plumbed	Plumbers' Median Earnings	Per Capita State Income	% of Plumbers Unionized	% of Plumbers Working 50–52 Weeks	State Law Plumbers Licensed/ Unlicensed	Licensing Requirement
Licensing Restriction: Prior Occupational Experience; Data: Journeymen Plumbers; Date: 1970; Number of Observations = 43									
Density of Plumbers =	0.056***			0.0003*	-0.0005	-0.008		-0.002	-0.002
	t=3.9			t=1.78	t=-0.85	t=-1.5		t=-0.4	t=-0.4
Density of Retail Sales =	0.115**	-0.6**	-0.0006						
	t=2.5	t=2.5	t=1.572						
Licensing Restriction: Skill Test; Data: Journeymen Plumbers; Date: 1970; Number of Observations = 33									
Density of Plumbers =	0.0393*			0.0003	-0.0001	-0.013**		-0.009	0.01
	t=1.93			t=1.50	t=-0.08	t=-2.2		t=-1.4	t=1.4
Density of Retail Sales =	0.0606	-0.25	-0.0004						
	t=1.52	t=-1.22	t=-0.91						
Date: All Plumbers; Date: 1950; Number of Observations: 48									
Density of Plumbers =	-21.06*			-0.003	0.0195***		0.11		
	t=-1.89			t=-1.2	t=4.13		t=0.6		
Density of Dilapidated Housing =	47.12***	-1.85***							
	t=12.	t=-2.51							
Data: All Plumbers; Date: 1960; Number of Observations: 48									
Density of Plumbers =	-0.379			0.0003	0.004		0.004		
	t=-1.59			t=-0.69	t=1.1		t=1.1		
Density of Dilapidated Housing =	45.97***	-49.56***							
	t=5.7	t=-3.0							

Significance levels of two-tailed t-tests: * indicates 10% level; ** indicates 5% level, and *** indicates 1% level.
Notes: Median earnings and per capita state income are in dollars/100.
Sources and Data Definitions: See Appendix.

haps most important the degree of plumbers' unionization becomes significant and remains negatively related to the stock of journeymen plumbers available to consumers. Again, as in the case of electricians, the relations in Table IV are blurred by the inability to control for local licensing or for varying types of plumbers' union behavior beyond simply the percent unionized. Clearly, adequate controls for these influences would enhance the usefulness of this analysis.[13]

As another check of the validity of the quality-proxy relationship, regressions were run for 1950 and 1960. In each case unionization data were unavailable; further, a different proxy for quality, percentage of housing dilapidated or lacking one or more plumbing facilities, was used. Results show the familiar inverse relations between density and service quality received.

VI. Other Occupations

Four other occupations for which some results were obtained were optometrists, sanitarians, real estate agents, and veterinarians. The statistical results are briefly summarized below.

Extensive licensing data were available on optometrists allowing multiple tests of the effects of licensing restrictions on their numbers. The actual results proved to be rather inconclusive suggesting that perhaps a more extensive model was needed. A typical system used supplemental social security income payments to the blind as the quality proxy. Table V reflects one interesting result—licensing barriers related (significantly) to the number of optometrists while larger numbers of optometrists were negatively correlated with density of recipients of aid to the blind. The most important result of the optometrist investigation utilizing many specifications of the model is that smaller numbers of optometrists per capita, for whatever reason, are strongly associated with a measure for poor eye care.

Sanitarians are basically health inspectors whose task is to insure sanitary conditions in such areas as public water supply, sewage, food processing, and restaurant food handling procedures.[14] Their absence invites deterioration of public health services. Sanitarians can be licensed (compulsory), certified (voluntary) or unlicensed. Table VI illustrates that restrictive licensing tends to lessen the numbers of sanitarians in isolated rural areas and the inner city, while suburbia and small towns evidence no significant impact. Also, certification (voluntary licensing) seems to increase the number of licenses compared to both no licensing and compulsory licensing.

Our findings concerning real estate salesmen and brokers and veterinarians are published elsewhere so only a brief synopsis will be given here [4; 6].

The effects of real estate broker licensing activities on test passrates and on the quality of real estate services received by the public seem to conform strikingly well to restrictive economic theoretic expectations. When passrates and service quality (measured inversely by duration of vacancy before sale) are examined systematically, the following statements are supported: (1) in states where overall number of brokers per capita are low, *urban* service

13. Rayack's (1973) time series analysis of passrates in Rhode Island and Massachusetts found that over time the height of this entry barrier was raised and lowered as a negative function of construction employment rates. This is the same as his findings with regard to electricians. Rayack's results for plumbers remained unchanged when the trade was disaggregated into journeymen and master plumbers. Again, this suggests licensing board policies inconsistent with "public protection" but not inconsistent with protecting the existing plumbers [19].

14. Sam Martin's research on the sanitarians is gratefully acknowledged.

Table V. Optometrists: Three Stage Least Squares Estimates of the Recursive System, 1970 and 1974 Data Pooled

Licensure Variable		Intercept	Time Dummy	Density	Opthal-mologists	Licensure Variable	Median Age	Mean[a] Income	School Index
Good Character	Density, pooled =	-0.0754** t=-2.0194	-0.0201** t=-2.5987			-0.0164* t=-1.9173	0.0058*** t=4.1975	0.0008 t=1.6493	0.1068* t=1.9267
	Blind, pooled =	0.0007*** t=5.0001	-0.0001 t=-0.8399	-0.0018 t=-1.2208	-0.0042* t=-1.7586				
n=98									
Sponsorship	Density, pooled =	-0.0005 t=-0.011	-0.0234** t=-2.261			-.0066 t=-0.801	0.0019 5=1.015	0.0015** t=2.262	0.0527 t=0.728
	Blind, pooled =	0.0009*** t=3.903	-0.00002 t=-0.442	-0.0040** t=-2.283	-0.0056* t=-1.999				
n=77									
Exam Passrate	Density, pooled =	-0.1089*** t=-2.8141	-0.0190** t=-2.1045			0.0458*** t=3.1188	0.0054*** t=3.7326	0.0006 1.0730	0.1302** t=2.2124
	Blind, pooled =	0.0006*** t=4.0231	-0.00006 t=-1.3743	-0.0014 t=-0.9689	-0.0021 t=-0.8269				
n=55									
Residence Requirement	Density, pooled =	0.0139 t=0.2553	-0.0196* t=-1.8236			-0.0099 t=-0.7599	0.0016 t=0.8763	0.0012* t=1.7799	0.0372 t=0.5158
	Blind, pooled =	0.0009*** t=3.6462	-0.00002 t=-0.4395	-0.0039** t=-2.0755	-0.0056* t=-1.9787				
n=55									

Significance levels of two-tailed t-tests: * indicates 10% level; ** indicates 5% level, and *** indicates 1% level.
[a]In dollars/100.
Sources and Data Definitions: See Appendix.

Table VI. Sanitarians

	Intercept	Sanitarians Per 100,000 Population Y_s	Sanitarian Median Income Y_c	Licensing Variable L	Y_s*L	R^2	F	N
Linear Log--Compulsory versus No Licensing: $q_s = \alpha + \beta_1 \ln Y_s + \beta_2 \ln Y_c + \beta_3 L + \beta_4 L \ln Y_s$								
Greater Metropolitan	24.99 (.51)	-6.9 (-1.23)	5.01 (1.31)	-234.02 (-2.25)**	26.59	.41	1.58	14
Lesser Metropolitan	-1.47 (.03)	-2.74 (.39)	4.23 (.65)	14.99 (.15)	-1.61 (.14)	.04	.2	28
Adjacent to Metropolitan	-20.06 (-.41)	.35 (.046)	3.03 (.71)	1.61 (.16)	-12.65 (-.14)	.10	.63	27
Semirural	-59.04 (-.7)	5.54 (.37)	2.33 (.21)	-132.69 (-.73)	16.00 (.77)	.23	1.74	28
Rural	-118.01 (-2.4)***	16.52 (2.81)**	-2.72 (-.84)	-335.51 (-.311)	39.18 (3.14)***	.66	8.77***	23
Log-Linear--Voluntary versus No Licensing: $\ln q_s = \alpha + \beta_1 Y_s + \beta_2 Y_c + \beta_3$								
Greater Metropolitan	1.02 (1.07)	-.00013 (-.73)	.00046 (1.07)	.72 (4.00)***		.52	5.42***	19
Lesser Metropolitan	1.72 (.282)***	-.00013 (-1.25)	.0004 (1.45)	.22 (1.83)*		.16	1.89	34
Adjacent to Metropolitan	.48 (.65)	-.000072 (-.39)	.00089 (1.93)*	.38 (2.13)**		.24	3.09**	34
Semirural	.67 (1.22)	.000064 (.41)	.00039 (.96)	.26 (1.67)		.17	2.09	35
Rural	.17 (.14)	.00037 (1.64)	-0.00068 (-1.17)	.16 (.49)		.11	1.00	29

Significance levels of two-tailed t-tests: * indicates 10% level; ** indicates 5% level, and *** indicates 1% level.
Sources and Data Definitions: See Appendix.

quality suffers; (2) where either passrates are depressed by licensing authorities or there are specified prior educational requirements, the result is lower quality service in *rural* area; (3) test passrates are enhanced by the imposition of educational minimum requirements and are lower when the brokers' incomes are higher. In addition to the above statements which contain some statistical significance, the signs of all variables in every regression were those predicted by the view of licensing as restrictive and harmful to service in contradistinction to the licensing proponents' claims to benevolence.

The exploratory results for veterinarians suggest that the relationship between occupational licensing and the state-by-state incidence of reported rabies (and brucellosis) is that the more strict the barriers to obtain a license, the fewer practitioners there are and that this results in an underdiscovery of animal disease thus possibly increasing the risk of infection to both healthy domestic animals and ultimately people. In this occupation the most stringent form of restriction is the limitation of the number of and enrollment in schools of veterinary medicine. Without a degree from such an institution one may not even apply for the license.[15]

VII. Summary And Conclusions

This study is the first broad exploratory empirical investigation on the effect on the received quality of service from state licensed occupations. It sought to answer purely factual questions about effects of government restriction. The most striking outcome is that, despite enormous practical and theoretical difficulties and quite dirty data, consistently from occupation to occupation there existed a strong negative association between per capita numbers of an occupation and measures of per capita quality of service received. Further, almost as consistently, restrictive licensing appeared to significantly lower the stocks of licensees. There is, then, evidence from several professions and trades that indicates that restrictive licensing may lower received service quality. We know of no contrary findings. This result can be quite useful in evaluation of present licensing statutes and in contemplation of future acts.

Data difficulties as alluded to above were enormous. Equally vexing was the problem of finding suitable quality proxies. It is our belief that much fruitful further work could be done on an occupation by occupation basis in which an in-depth investigation of all of the particularities of the occupation could be explored.

Appendix

Data Definitions

Sources are in brackets. Dummy variables are zero except where the specified condition is met.

ELECTRICIANS

Density of Electricians: Employed electricians/KW hrs. generated, nonindustrial [26; 28]
Density of Death: Electrical deaths/KW hrs. generated, nonindustrial [34; 28]

15. The result could conceivably be interpreted the other way; viz., that large numbers of veterinarians *per capita* are positively associated with large numbers of discovered *and* actual cases. In this reasoning either veterinarians cause or follow rabies and brucellosis cases.

Density of Pre-1939 Houses: Number of houses built before 1939/total houses [25]
Electricians' Median Earnings: Median earnings, all earners [26]
Per Capita State Income: Disposable income per capita [22; 26]
Unionization: IBEW members, nonapprentice/employed electricians [30; 26]
Licensed/Unlicensed: Equals 1 if the state licenses journeyman electricians [12]
Experience (Journeymen): Equals 1 if 5 or more years of apprenticeship prior to licensure are required by the state board [5]
Oral Exam: Equals 1 if the state board requires an oral examination [5]
Non-Industrial Electric Energy: Production by Electric Utilities and Industrial Plants [28]

DENTISTS

Density of Dentists: Number of dentists/population of state [26]
Dental Earnings: Net income, mean, 1970 [2]
Per Capita Graduates of Dental School: Graduates/state population [1; 26]
Citizenship, Reciprocity: Equals 1 if requirement met [3]
Quality Measures: From the dentist's point of view (adjusted frequency): Too busy, not busy enough, hours spent in patient contact: From the patient's point of view: percent waiting 3 days-1 week for an appointment, or over 1 month. Based on a questionnaire fill out by approximately 7,800 dentists [2].
Percent with fluoride in the water: [11]
Per Capita Density of Dentists in SMSA: Number of dentists/state population [26]
Per Capita Enrollment of Dentists in Continuing Education Program: [1; 26]
SMSA-Median Family Income, Median Years of School Completed, Percentage of the Population 65 or older: [26]
Whether or Not Dental Specialists are Licensed: [3]
Edentulousness Data: Own but never use false teeth [33]
SMSA Sample: Boston, New York, Philadelphia, Detroit, Chicago, Cincinnati, Los Angeles, San Francisco, Baltimore, Atlanta, Buffalo, Cleveland, Minneapolis, Milwaukee, Kansas City, St. Louis, Houston, Dallas, Washington, D.C.
Naval Recruits Oral Hygiene Index: Based on a sample of 477 recruits [29]

PLUMBERS

Density of Plumbers: Employed plumbers/number of year-round housing units with all plumbing facilities [26; 25]
Retail Sales: Retail sales of plumbing supplies/number of year-round housing units with all plumbing facilities [25; 27]
Percentage of Houses Fully Plumbed: Number of year-round housing units with all plumbing facilities/total number of year-round housing units [25]
Plumbers' Median Earnings: Median earnings, all earners [26]
Per Capita State Income: Disposable income per capita [22]
Unionization: Plumber-members of AFL-CIO, affiliated unions nonapprentices/number of year-round housing units with all plumbing facilities, [30; 25]
Licensed/Unlicensed: Equals 1 if the state licenses plumbers [31]
Experience: Equals 1 if 2 or more years of apprenticeship are required for license [5]
Skill Test: Equals 1 if a practical skills test is required for license [5]
Delapidated or lacking one or more plumbing facilities: [28]

OPTOMETRISTS

Density: Active optometrists/state population [14; 26]
Blind: Number of recipients of supplemental security income payments to the blind/state populations [28; 26]

Time Dummy: 1974 = 1, 1970 = 0; constructive to allow for intercept change.
Median Age and Mean Income of State: [26]
Good Character: Equals 1 if state has a good moral character clause within its statutes [32]
Residence Requirement: Equals 1 if any prior residence is required [32]
Sponsorship: Equals 1 if the sponsorship of a current license holder is required [32]
Passrate: New licenses issued/total license applications [5]

SANITARIANS

The model is of the form $q_s = f(Y_s, U_c, L, YR)$ where
q_s = The number of sanitarians in 1962 per 100,000 inhabitants in the intrastate region [16]
Y_s = Median income of sanitarians employed by state and local governments in 1962. Here Y_s is a "proxy" for expected permanent income. For this reason, the coefficient of Y_s could be expected to be biased downward [17]
Y_c = Disposable income per capita, 1962 [22]
L = Zero-one qualitative variable which takes on the following values in the two cases of comparison: (Compulsory vs no licensing, compulsory = 1; Voluntary vs no licensing, voluntary = 1) [35]
YR = A multiplicative interaction variable equal to $Y_s{*}L$ which measures the interaction of compulsory licensing *and* income on the number of sanitarians. This is not used in the voluntary-non-licensed comparison.

Within the states, data on density of sanitarians, q_s, is further subdivided into five regions: Greater metropolitan areas—counties within a state with a million or more inhabitants; Lesser metropolitan areas—between 50,000 and 1,000,000 people; Adjacent to metropolitan areas—counties which are "adjacent to" counties classified as either greater or lesser metropolitan areas; Isolated semirural areas—counties which contain at least one uncorporated town of 2,500; Isolated rural counties without at least one incorporated town of 2,500.

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State Dental Practice Acts: Implications for Competition

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Abstract. This article analyzes the effects of state dental practice acts on competition in the market for dental services. Three types of practice act provisions are examined: (1) restraints on advertising and soliciting of patients; (2) limits on scope of practice and number of dental hygienists per dentist; and (3) restrictions on the form of organization and ownership of dental practices.

The empirical results suggest that limits on number of offices per dentist and absence of reciprocal licensing arrangements are associated with higher fees and net incomes among dentists. Restraints on number of hygienists per dentist are positively associated with dental fees, but not with net income. Restrictions on commercial advertising are related to higher net income, but not fees. There is no significant intercorrelation among the various practice act provisions.

The analysis concludes with a discussion of policy implications for competition in dentistry and a suggestion that practice act changes are both a cause and an effect of the general metamorphosis observed in the dental marketplace. The potential indirect effects of national health insurance and altered reimbursement policy are discussed.

Introduction

This article is about the economic implications for communities of state dental practice acts. It concentrates on three provisions which regulate advertising and soliciting of patients, dental auxiliaries, and organization and ownership of dental practices. These areas offer some key opportunities for enhancing competition in the dental care market. Competition as a market process can influence the price, technical quality, amenities, and even the production process of dental services. While most discussions of

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competition focus on prices, **nonprice** margins are affected by the extent of competition in the marketplace.

The background for this article is the Federal Trade Commission's (FTC) activity with respect to the dental profession, which is taking place on two fronts. First, the FTC has issued a formal complaint against the American Dental Association (ADA) and four of its constituent societies. [1] The complaint alleges that (1) the adoption and enforcement of the ***ADA Principles of Ethics*** have eliminated competition among dentists in the United States, and (2) the ADA has agreed and acted with four of its constituent societies to eliminate competition in Indiana and Virginia. The complaint charges that enforcing the code of ethics fixes or otherwise interferes with prices of dental services, deprives consumers of information pertinent to selection of a dentist and of the benefits of competition, and restrains the development of innovative systems for delivery of dental services. [2]

The relief being sought by the FTC is an order prohibiting the respondents from publishing or enforcing any agreement, principles of ethics, or interpretations which would restrict a dentist's freedom to advertise, solicit patients, or independently determine fees for services.

This complaint has contributed to several recent actions of state administrative bodies, legislatures, and the dental profession:

(1) In October 1977, the ADA House of Delegates passed a resolution advising local dental societies not to impose sanctions on member dentists who advertise, though the association resolved that ads should be confined to information on services and fees for routine dental procedures. [3]

(2) In several instances, state bodies have moved to overturn the practices being challenged by the FTC. For example, the New York Board of Regents has repealed its ban against advertising by professionals, including dentists; and in July 1978, the Virginia practice act was revised. Previously, the law specified that the dentist's license could be revoked for advertising professional services to the general public. Now the law requires only that advertising not be false or misleading, not contain claims of superiority, nor be in violation of other regulations as created by the Board of Dental Examiners.

(3) In February 1979, the ADA agreed to an interim settlement of the FTC complaint, but final resolution awaits the decision in the pending appeal of a similar complaint by the FTC against the American Medical Association.

The three responses just outlined are the logical byproducts of three cases decided by the Supreme Court within the last three **years**—***Goldfarb***

v. Virginia State Bar,[4] *Virginia State Board of Pharmacy v. Virginia Citizen's Consumer Council,*[5] and *Bates v. Arizona State Bar.*[6] A simple interpretation of these cases clarifies their import for practice acts in dentistry and other health professions. *Goldfarb* essentially established that the exemption of the "learned professions" from federal antitrust laws does not exist. Private behavior of professionals is subject to antitrust attack, except where that behavior is compelled by the state acting as sovereign. Next, the Supreme *Court,* in *Virginia Board of Pharmacy,* declared that advertising of prescription drug prices by pharmacists was protected under the First Amendment, but decided not to rule on whether advertising of *professional services* (including legal and health services) was similarly protected.

In *Bates,* the Court ruled that restrictions on advertising of legal services were unconstitutional, in that such restraint violated the right of free speech. Four justices filed dissenting opinions, generally arguing three propositions: (1) professional services are not sufficiently routine to permit standard prices, so the meaning of any advertised price would be dubious; (2) the potential for deception and misleading claims in professional services is greater than in the case of ordinary commodities; and (3) policing the validity of advertised claims would be too costly, given the absence of definitive empirical tests of the validity of these claims. The dissenting opinions, though they pertain specifically to advertising, illustrate the spectrum of professional and social concerns about the broader implications of competition in dentistry.

Competition as a process has social value to the extent that it results in lower prices for a given level of quality (not exclusively as evaluated by clinicians), and a configuration of services that fits the demands of well-informed consumers. In evaluating whether the social controls embodied in practice acts are beneficial, their impact on *each* dimension and the trade-offs among the different dimensions (e.g., price vs. quality) must be weighed carefully. When the courts and legislatures evaluate state practice acts according-to the criteria, they will necessarily carry the burden of proof.

Empirical evidence and economic theory in combination suggest that restrictions on advertising typically result in increased prices, little or no effect on quality, and an increase in consumer search costs.[7] In this light, the burden of proof ought to rest on those who favor restrictions on professional advertising.

An advantage of competition as a decentralized mechanism is that trade-offs among price, quality and the match of supply to the mix of services demanded are made in the marketplace by those providers and consumers with an immediate stake in the solution. Consumers in a competitive market can choose from among a variety of options. They vote

with their feet and their dollars in such a system, and the need for legislatures and courts to balance these trade-offs in a political marketplace is mitigated. Competition works most efficiently and equitably when consumers are well-informed, and a clear, testable definition of the well-informed consumer is a precondition to sensible evaluation of competition in dental services; such consumers are aware of the identity, location, price, professional experience and mix of services of alternative dental care providers in the local market. Consumers will judge quality on the basis of individual past experience with a specific provider and on the basis of publicly available results of professional peer review. If these conditions are met, the consumer will not be perfectly informed, but that is not required for effective competition among providers.

So the issue is not a theoretical ideal. Instead, one is faced with the need to modify a world of imperfect institutional arrangements in order to stimulate the benefits of competition. As far as state dental practice acts are concerned, the FTC regional investigation is most relevant at this point. That search is concentrating on information disclosure to consumers (e.g., advertising), hygienists' scope of practice, and dental practice ownership (as well as other public and private practices the FTC deems potentially restrictive). The investigation is based on the Commission's Consumer Protection Authority, rather than on antitrust. The FTC claims that it has the authority to preempt state laws which violate the FTC Act. The jurisdiction of the FTC under that Act includes restrictions which constitute "unfair methods of competition or unfair or deceptive acts or practices." [8]

Several empirical issues must be explored before one can judge intelligently the probable impact of changing these provisions of state dental practice acts.

(1) Would advertising by dentists produce a more informed consuming public? To know the answer, the incentives of providers to supply useful information on price and quality would have to be evaluated. [9] One of the difficulties with encouraging rational shopping in health services is to create advertisements which convey information on price and quality *simultaneously.* It is the quality-adjusted price that matters. In addition to the problems consumers face in ascertaining the relative utilities of different price/quality combinations in the market, empirical research must overcome thorny measurement issues in estimating such quality-adjusted prices.

(2) When the dentist is freed from proscriptive legislative restraints on the use of auxiliaries, will higher productivity be more efficient? If so, will lower costs be passed along to consumers in lower prices for dental care?

Research suggests that the net income [10] of the individual dentist is increased and productivity [11] is enhanced when dental auxiliaries perform

expanded functions. A real need exists to replicate these few studies in a larger number of private practices. Still, the preliminary data suggest that legislative restraints on auxiliary exployment are not in the economic interest of dentists as individuals. One is left with a paradox: the organized profession is resisting change in the production function for dentistry while initial findings indicate that increased utilization of Expanded Duty Dental Auxiliaries **(EDDAs)** benefits the individual dental firm. A possible explanation for this is that dentists as a group resist competition among themselves and from new entrants, even though individual dentists try to provide services as efficiently as possible (and thus, at least implicitly, to compete for patients).

(3) Would loosening practice act constraints on organization and ownership of dental practices release the benefits of competition to consumers? In this case, the evidence is scant. State statutes almost universally place ownership and control of dental practices in the hands of licensed dentists. The legal pattern reflects a persistent historical consensus that the corporate practice of dentistry (and medicine) would produce pernicious outcomes. However, this consensus is eroding, as the public challenges the validity of ***professional control*** over health care decision making. [12] This will be discussed in more detail below.

Provisions on advertising

Table 1 shows that prohibition on the use of company, business, or corporation names other than "professional corporation" is universal. [13] Dentists are forbidden to employ advertising agents, to advertise superior performance, and to claim that any procedure is done painlessly. Of course, false or misleading claims are outlawed in all states. Generally, the dentist can list name, location, degree and office hours in telephone and professional directories, on appointment and professional cards, and by placing door and window lettering or signs at the office.

As Table 2 makes clear, price advertising is extremely limited; only four states allow it in any form. In fourteen states, only the advertising of name, location, degree and office hours is permitted. Price and location advertising are particularly important because of their relative effectiveness in promoting new business and in introducing new dentists to the marketplace.

It is useful to contrast the pattern of laws on advertising with recent events. For example, evidence from several states-most notably Arizona, Maine and New York-indicates that price advertising can be an effective device for competing. In Arizona and Maine, even though advertising is prohibited by the state dental practice act, dentists advertise dentures at prices which undercut those being charged by the so-called

Table 1. State Practice Act Provisions on Dentist Advertising and Soliciting of Patients (as of September 1978)

	General Pattern for All States
	Use name of company, business name, or corporation (except professional corporation) in connection with practice of dentistry.
	Use an advertising agent.
Cannot	Advertise professional superiority.
	Advertise to perform any dental procedure painlessly.
	Make false or misleading claims.
	List in phone and professional directories.
Can	Print appointment cards.
	Print professional cards.
	Print door and window lettering, office signs.

denturists, dental lab technicians who sell dentures directly to the public. No disciplinary action has been initiated against these advertising dentists, and results so far indicate that advertising has enabled them to compete effectively with the denturists.

The economics of search implies that high-cost items such as dentures are likely to be advertised, since consumers are likely to gain from searching for lower prices. Dental services are highly price-elastic, so consumers will respond significantly to price differences. [14] At present, the incentives to search are not diminished by insurance to the same degree in dentistry as they are in medicine and hospital care. As dental prepayment increases, however, shopping is likely to decrease for highly insured items.

The dental profession may well continue its support for advertising as an effective weapon against dentist surrogates such as denturists who sell dentures directly to the public. In contrast, the profession will probably resist advertising which encourages competition among dentists. The

Table 2. Variations Among Certain States in Their Provisions on Advertising and Soliciting of Patients (as of September 1978)

	Number of States Which Allow this Practice
Allow only	
Announcement of recent office opening	10
Advertising a specialty	6
Both the above	10
Allow limited ads	
Newspaper ads, with dentist's name, location, degree and hours	14
Availability of credit, but not terms	1
Both the above	4
Allow some price advertising	
Can advertise prices only when services/materials required are not variable	3
Can advertise prices for dental services in general, as well as terms of credit	2
Board determines limits of advertising	1

competitive consequences of advertising are illustrated in a recent article in the New *York Times.* [15] The article cites a Long Island dentist whose business has increased fivefold since he began advertising prices. Most price-cutting seems to be concentrated on dentures in predominantly low-income and blue-collar suburbs. Dentists employ advertising as a relatively low-cost way to attract customers. So long as the advertising of lower prices only ***expands*** the market, the incidence of 'competition within the profession is minimized. However, dental demand is finite and, consequently, the point of intraprofessional friction may be reached rather quickly.

Nonetheless, the drift of the court cases is clear-bans on professional advertising of price are not legally enforceable. Pressures for change in state practice act provisions on advertising will likely produce stipulations that such advertising (1) must be truthful; and (2) may contain price information, as long as the complementary information necessary to interpret those prices is also present. For example, minimum prices for routine services will be advertised along with a statement of the conditions under which above-minimum prices may be charged. Any FTC regulations regarding dental advertising will probably leave open states' options for

requiring certain affirmative disclosures, but the courts are not likely to sustain information requirements which aim to raise the advertising costs' of price-cutters. Strictures will remain against such practices as claims of superior performance, use of patient testimonials, and guarantees of painless work.

The scope of practice of dental auxiliaries

Dental auxiliaries' practice scope offers another margin of behavior on which dentists might compete (through lower prices and more efficient delivery). Sensible social policy might well be to let consumers decide whether they prefer certain procedures to be done by auxiliaries or by dentists. Legal restraints might then be limited to requirements for supervision and appropriate training. The well-informed patient would weigh the value of traditional dentist/auxiliary patterns of task delegation vs. the gains in terms of lower price and time per visit.

Fourteen states limit the number of auxiliaries employed *per dentist.* Until September 1977, Texas limited the number of dental hygienists per office to two. Such numerical constraints serve to narrow the scale of a dental practice, and indirectly discourage development of large-volume practices. Empirical research is needed to sort out the impact of these provisions on the price and output of dental services.

Table 3 highlights the legal mechanisms used by different states to limit the delegation of expanded functions: the categories are not mutually exclusive, but display different approaches taken by states. Notice that the listing of what is allowable is more prevalent than the proscriptive approach which specifies which functions *cannot* be delegated.

The issue raised by these alternative approaches is how much discretion may be exercised by individual dentists in delegating tasks. The more discretionary approach of the open practice act allows more rapid innovation in practice methods, subject to the constraint that the auxiliary be trained in an education program approved by the Commission on Accreditation of the ADA. Another factor favoring the open approach is the time required to change state laws. Notice that each approach, open or proscriptive, involves costs of error. If one imposes proscriptions, innovation is slowed and the availability of services is limited, but the risk of mistakes from new ways of delegating tasks is limited. Alternatively, an open approach encourages quicker diffusion of new methods of practicing, but may risk more adverse health outcomes in the short-term. While the qualitative error costs differ between these statutory options, there is no clear-cut presumption that net costs, in quantitative terms, are lower for one option or the other. The costs of decreased availability have largely been ignored, while the costs of treatment mistakes have been empha-

Table 3. Legal Provisions for Delegating Expanded Functions: Fall 1977

Type of Legal Mechanism	Both Assistants and Hygienists	Assistants Only	Hygienists Only	Total
Open Act: delegation of any function taught in approved educational program	2	3	7	12
Rules and regulations determined by state dental board, according to its statutory authority	40	1	2	43
Specific list of functions which may be delegated	21	2	9	32
Specific list of functions which may not be delegated	17	2	1	20

sized, but not measured. Again, it is time to trace carefully all these costs and thus to highlight legislative choices between these strategies.

State practice acts also vary in their requirements for professional supervision of the auxiliary's functions. For example, in California only general supervision of the dental hygienist doing root planing is necessary, but direct supervision by the dentist is required when the auxiliary does closed soft tissue curettage. Table 4 presents the definitions of these distinct categories of supervision. How the issue of supervision shades into the possibility of independent practice has been highlighted recently in California: In the case of a dental hygienist who was practicing under a dentist's general supervision, but in adjoining space, a legal question arose as to whether the-hygienist was practicing independently and thus violating the state dental law. In a recent decision, the State Board of Dental Examiners ruled that the hygienist, who had been seeking sole proprietorship status, might provide services for dentists under a contractual agreement, provided very specific requirements were met: (1) the name of each dentist for whom she performs services must be placed on each outside door to her facility; (2) before she begins service for any other dentists, she must notify the Board at least 45 days in advance; and (3) dentists for whom she provides services must direct and supervise them, exercise jurisdiction and control over the setting, and comply with all related statutes and regulations. [16]

The Board clarified the link between the dentist and the hygienist-the

hygienist in question was not to practice independently. The sale of dental hygiene services is tied economically to dental services; the tie is rational given the profession's collective power to restrain competition, since control over a potential dentist surrogate can be used to increase demand for dentists' services. Also, the tied commodity (hygiene services) can be used to meter differences among consumers in their demands for dentists' services. These measured differences yield information which might be employed to discriminate among consumers on fees for dental services.

Ownership and organization of dental practices

In general, state laws specify that dental practices must be owned and managed solely by licensed dentists. Customarily, the incorporated dental practice is organized according to the state's professional corporation act (PCA) and is treated as a for-profit business corporation. Shares in the incorporated dental practice are only transferable to another licensed dentist. However, exceptions to these rules exist, as do some interesting variations in state restrictions on the numbers and types of persons who may incorporate and the number of different offices which a single dentist may operate. Table 5 shows the pattern of these provisions, making clear that only two states require more than one person to incorporate a dental practice. Similarly, the right to hold simultaneous positions in more than one incorporated practice is restricted in only five states. Three states limit dentists to operating one office at a time, while the District of Columbia Practice Act gives the Board the option of placing a limit on multiple offices per dentist.

Limits on number of incorporators probably have only a small impact on market entry, and thus will not appreciably affect either prices or output of dental services. Incorporation by one or two dentists is primarily a means to capture certain tax advantages in retirement plan contributions and profit-sharing.

Table 4. Required Supervision of Dental Auxiliaries

Direct	**Direct supervision by the licensed dentist, *present in room***
Indirect	**Indirect supervision by the licensed dentist, present in office or treatment facilities**
General	**General supervision by the licensed dentist who has responsibility for the function performed by the auxiliary, but is not necessarily present in the office**

Table 5. Statutory Provisions Shaping Ownership and Control of Dental Practices (1977)

	Number of States with Provision
Number and Status of Incorporators	
Need-at least three natural persons to incorporate (but only one shareholder)	1
Need two or more dentists (but only one shareholder)	1
Need at least one natural person (and only one shareholder)	1
Right to Hold Simultaneous Corporate Positions	
No person may be simultaneously an officer, director, or shareholder of three or more professional corporations	1
No person may be simultaneously an officer, director, or shareholder of two or more professional corporations	2
No person may be simultaneously an officer or shareholder of two or more professional corporations	1
No person may be simultaneously a director or shareholder of two or more professional corporations	1
Number of Offices Dentists May Operate Without Board Approval	
One office	3
Board may determine number of offices per dentist	1 (D.C.)

Constraints on the number of simultaneous corporate positions are not likely to increase the costs of entry to dental markets. Entry may occur in any of several ways in an economic market: e.g., the decision to enter the industry, or to relocate one's practice within the industry, or to differen-

tiate one's product or service mix from the rest of the industry (in effect, creating a new market). Since none of these dimensions will be influenced significantly by the right to hold simultaneous corporate positions, entry should not be diminished significantly by such restrictions. In fact, by separating the ownership of different incorporated dental practices, such rules may slightly enhance competition. These limits are analogous to the federal antitrust restraints on horizontal mergers. The rationale for the latter is that increases in the number of independent firms in a given market raise the costs of collusion, thus increasing competition in that market.

In contrast, the effects of constraints on number of offices which a dentist may operate are not as benign. The dentist who practices in more than one location increases the effective number of competitors in the marketplace. Even a part-time dentist entering a geographic market expands the number of substitute providers available to residents of that area. The strength of this competitive effect will be inversely related to requirements for supervising auxiliaries, since they (particularly hygienists) may be the principal labor input in the secondary practice sites operated by a single dentist. Particularly in light of the growth of dental care prepayment, nonpecuniary costs will become more important to consumer choice among dentists. The elasticity of demand with respect to the costs of time and inconvenience will increase as insurance drives down the sensitivity of consumers to money price. Empirical health services research has shown that increases in the number of suppliers lead to lower time costs per capita.[17] Presumably the individual dentist is the best judge of how many offices he may profitably operate. The dentist may wish to serve the needs of consumers in different areas, and multiple offices enable easier access by each of those consumer groups.

Historically, state practice acts have inhibited the growth of health maintenance organizations, especially of the closed panel plans. Restrictive features of these laws included requirements that medical societies approve articles of incorporation, that they sponsor or control the plan's directors or trustees, and that state insurance reserve requirements to HMOs be applied.[18] These restraints have slowed the diffusion of the HMO concept to dentistry. Even though the HMO Act of 1973 preempts these state laws for HMOs qualified under its provision, the standards for qualification are so tough as exclude many of them. Thirty-two states have enacted HMO enabling legislation, however, and this should promote their growth. Furthermore, set against this statutory support for HMOs are a variety of resisting -pressures: (1) the relative share of dental HMOs in the prepayment market has actualy declined over time (in the absence of any discernible tightening or legal rules respecting them); and (2) if a new delivery mode is to prosper, promotional opportunities must be rela-

tively uninhibited; yet, even given recent legal decisions, ethical and informal professional constraints against all-out promotion still prevail.

The involvement of business in delivering dental care to the general public is just beginning to take shape. In California, Sears is now leasing space to a dentist who operates a multi-chair dental clinic, employing several part-time dentists and auxiliaries. The clinic is open seven days a week during the same hours as the store and uses the public address system to inform customers of the availability of dental services. [19] In this model Sears is only the landlord, but the leasing arrangement may represent a precursor to the franchising of dental care. Notice that the promotional and marketing practices of the Sears dental clinic are dependent on a state practice act environment which is conducive to commercial advertising. Recent developments such as Good Care Dental Centers and Dent Care Systems, which involve franchise arrangements among a parent corporation and individual dental practices, will provide an important market test of the economic and legal impacts of new ownership modalities in dentistry.

Preliminary empirical tests

A first step toward evaluating the importance of the various provisions of state dental practice acts is to test empirically their economic effects. This section presents the results of preliminary empirical tests of specific provisions on the fees and net income of dentists. If state dental practice act provisions restrict competition, one would expect restrictive provisions to exert a positive effect on fees and net income. It is not the purpose of this article to test definitively those hypotheses with a fully specified econometric model, but rather to take the first step toward doing so.

Before examining the independent effects of each practice act restriction on fees and net income, one might wish to determine if the various restrictions are positively correlated with one another. For example, do states with relatively restrictive provisions on dental advertising also have more restrictive ones regarding task delegation to auxiliaries and limits on number of dental offices per dentist? While not a necessary implication of the hypothesis that practice act restrictions are anticompetitive, the presence or absence of such a correlation shouldilluminate the investigation of competitive effects. By controlling each potential margin for competitive behavior, organized dentistry would be sewing the loopholes through which price-cutting and other competitive activity among dentists might occur. In addition, if one sought to scale the restrictiveness of state dental practice acts, one would first need to test assumptions about the intercorrelation among the various dimensions of those acts.

Accompanying the incentives to restrict each margin is a set of offsetting forces. First, the legislature must balance the costs and benefits of each restriction. The political calculus weighs not only dentists' interests, but those of consumers. The balance of these interests is likely to differ among the various restrictions. Even starting with the assumption that concentrated producer interests generally will prevail over diffuse consumer interests, the relative strength of the opposing coalitions will vary depending on the issue. Also, there will exist a competitive fringe-dentists who are prepared to cut prices and practice in alternative configurations—who will lobby against provisions which constrain competition.

For example, the political opportunity costs (foregone support in the form of votes and contributions) of restricting reciprocal licensing agreements with dentists from other states are minimal to the legislature, while the gains to dentists within the state are substantial. Similarly, limits on the number of offices per dentist do not impose directly visible costs on consumers, nor is there a large competitive fringe of dentists seeking to operate in multiple offices. Hence, the path to office limits is likely to be relatively free of obstacles.

On the other hand, limits on delegation to auxiliaries are problematic. The benefits of such limits to dentists as a group are not clearly demonstrated. By narrowing the scope for innovation in practice methods, such limits might indirectly inhibit competition, but imply a welfare loss to dentists if the technical efficiency of each producer is compromised. Clearly, there are potentially opposing effects: if limits on innovation restrict future prospects for competition, future dental profits would be increased. However, limits on innovation lower profits which can be earned in the present.

Table 6 illustrates that, in general, the various practice act provisions are not correlated with respect to their restrictiveness. Pairwise Spearman rank correlation coefficients are presented for five types of practice act restrictions-limits on multiple offices per dentist, reciprocal agreements with other states for licensing dentists, proscriptive specification of tasks which dentists may delegate to hygienists, commercial advertising, and limits on the number of hygienists per dentist. Based on the analysis of state dental practice acts for 1970, each state's law regarding the five dimensions was ranked according to restrictiveness. The Appendix explains how that ranking was derived. The only significant correlation was between advertising and auxiliary delegation, and the negative sign was contrary to the hypothesis. Thus, there is no empirical support in the 1970 data for the hypothesis that practice act restrictions are positively intercorrelated.

Table 6. Spearman Rank-Order Correlation Matrix

	OFFLIM	NONRECP	COEMAUX	ADVERT	HYGNUM	FEE	INCOME
OFFLIM							
NONRECP	.17						
COEMAUX	.08	.00					
ADVERT	.05	.07	−.28**				
HYGNUM	−.05	.01	−.14	−.08			
FEE	.34**	.30**	.17	−.06	.23*	-	
INCOME	.25**	.23*	.15	.24*	.14	.59***	

* significant at $p \leq .10$
** significant at $p \leq .05$
***significant at $p \leq .01$

Notes:

OFFLIM = Office limits.
NONRECP = Absence vs. presence of reciprocal licensing arrangements.
COEMAUX = Restrictions on auxiliary delegation.
ADVERT = Restrictions on commercial advertising.
HYGNUM = Number of hygienists/dentist limits.
FEE = Shepard's composite fee index (1970).
INCOME = Dentist mean net income (1970) adjusted for price level.

The absence of intercorrelation provides evidence that effectiveness in restraining one margin of potential competition does not necessarily imply either the power or incentive to control all margins of potential competition through state practice acts. However, controlling a subset of these dimensions might still yield anticompetitive results. Examining the rank correlation between the various practice act restrictions and the level of fees and net income, [20] respectively, reveals that limits on multiple offices and absence of reciprocal licensing agreements are positively associated with both fees and net income (at the . 10 level of significance), but the correlation with fees is insignificant and in the opposite direction from what one would expect.

Interpreting these preliminary results is difficult. The positive correlation of office limits and the absence of reciprocity with fees and net income may suggest some anticompetitive effect, but a more accurate test is needed. Other determinants of dentist fee levels and net income should be included as independent variables with the measures of practice act restrictiveness. For example, time prices, per capita income, and input prices (e.g., auxiliary wage rates) contribute to the level of dental service prices. Future empirical work will incorporate these variables.

Limits on the number of hygienists per dentist are positively correlated with fees, but the correlation with net income is insignificant. In the absence of a more complete model of fee and net income determination and, given the inconsistency of the effects on incomes and fees, these findings are only suggestive. A fruitful next step would be to determine empirically whether such constraints increase production costs independently of any anticompetitive effect on fees.

The insignificant (and unanticipated) sign of the correlation of advertising restriction measures with fees is inconsistent with the significant positive correlation with net income; there is no explanation for this finding. A more appropriate test for the effect of advertising would rely on more recent data (especially since the ***Bates*** decision), since the evidence from public sources suggests that only recently have dentists begun to advertise in a significant number of states. Therefore, previous practice act constraints have not been binding on dentists' behavior.

The cross-sectional pattern of practice act restrictions is erratic. If state level dental organizations had gained control of those margins with the greatest potential for influencing competition (an empirical proxy would be their impacts on dentists' fees and net incomes), one would expect restrictions on those margins to be positively correlated. Also, practice act restrictions regarding reciprocity and office limits (which are significantly positively correlated with dentist fees and net income) would be expected to be positively correlated with one another. However, they are not. In fact, with one exception, and that correlation is negative; the rank corre-

lations between practice act provisions are statistically insignificant. Hence, even if all dimensions are not constrained, the results for limits on multiple offices, reciprocity, and number of hygienists per dentist offer clues for future empirical work.

Policy implications

The change in state dental practice acts has been gradual, but mounting social and political forces are pushing it forward, and several developments may be predicted.

Most restraints on commercial advertising of dental services will be relaxed, particularly regarding price advertising for routine services. As such advertising spreads, pressure will build to specify more clearly the nature of services to be rendered. Consumers who search for low prices will expect some form of prior assurance about the ***content*** of services. Notice that as advertising-induced competition diminishes the market power which underlies providers' ability to discriminate among consumers (in terms of money price, time price and amenities), it becomes less important that ***each*** consumer search intensively and efficiently. Prices will be set at the margin, and a corps of efficient searchers-most likely well-educated consumers, insurers, and unions-would be sufficient to assure benefits by prompting competition. Also, the incentive to avoid surprising the consumer will influence providers to standardize prices, even though the services required by each consumer, and so the cost, will be determined individually.

Increasingly, public -and private mechanisms will displace exclusive professional control of the dental care market. The likelihood of prohibitions on advertising is both a cause and an effect of this metamorphosis. By promoting expansion in the scope of the dental care marketplace, and improving consumers' knowledge of prices, location, and office hours, advertising will enhance the climate for other innovations in dental service delivery. Viewed another way, these pressures for information disclosure are also symptoms of a challenge to the notion of a professional guild running its own show?

As the guild model for market control weakens, we are likely to see a shift toward the open practice act approach to delegation to auxiliaries, a reduction in limits on number of auxiliaries a dentist can employ, along with increased experimentation with HMOs and unique promotional sharing relationships between dental practices and business corporations skilled in merchandising and marketing. The preliminary empirical results suggest that practice act provisions regarding number of hygienists, limits on multiple offices, and reciprocity merit a closer look for effects on competition in the dental care market. Restrictions on these margins are

positively correlated with levels of dentist fees and net income, yet the presence of one such restriction in a state is not correlated with the presence of others in that same state. Why are there these differences within states' dental practice acts among alternative competition-influencing provisions?

This article has offered an explanation that relies on the differential costs and benefits of various restrictions. Another explanation is that the individual restrictions are not part of a coherent strategy to limit competition; alternatively, though certain restrictions may be related to apparently anticompetitive outcomes (higher fees and higher net incomes), the organized profession might be concentrating on other objectives in formulating policy regarding state dental laws. The evidence in this article merely hints at several legal constraints which have the potential for limiting competition in dental care markets, but the analysis does not (by its very nature) speak to the intentions or objectives of the various interest groups influencing policy at the level of state practice acts. Moreover, future work examining these questions should take into account heterogeneity within the dental profession, which implies a correspondingly nonuniform approach to practice act regulation.

An intelligent forecast of the future for dental practice act provisions regarding advertising, auxiliaries' scope of practice, and ownership and organization of dental firms must incorporate the likely effects of rapid growth in private dental insurance plan enrollment. Dental advertising will diminish as dental insurance covers more people and as a deeper benefit package is provided. Advertising is a less effective substitute for consumer search when the consumer is a firm engaged in multiple transactions within the same market for each dentist and across all participating dentists. The insurer takes advantage of economies of scale in both price and quality search among dental providers. This implication remains whether the insurance plan is public or private.

Insurers' reimbursement policy will influence the number of dental auxiliaries employed per dentist, as well as their practice scope. Generous fee schedules for delegated tasks will increase demand for auxiliaries. The impact of reimbursement policy on demand for auxiliary manpower in a state will depend directly on the scope of delegable duties and any practice act constraints on number of hygienists per dentist. If a state's practice act effectively constrains the number of hygienists per dentist, an increase in demand which is the, consequence of insurance will increase the scope of duties delegated to each hygienist and will raise the price for the hygienist's services. The supply of hygiene services will adjust mostly through increased wage rates and expanded scope of duties, and one will observe only slight effects on the number of hygienists.

Similarly, as dental insurance becomes more available, reimbursement

for treatment costs in excess of a certain dollar threshold will be subjected to prior authorization by insurers. Where feasible, the contracts will specify payment only for the lesser-cost treatment plan. Clearly, the dentist's economic incentive would be to assign dental auxiliaries to certain procedures. Inevitably, reimbursement shifts of this type will force a loosening of practice act restrictions on auxiliary manpower and scope of function.

The few remaining limits on multiple offices per dentist are not likely to survive extensive growth in dental insurance. Particularly in the case of public financing of dental care, multiple offices become efficient to operate when dental demand is made more equal between socioeconomic groups and local geographic areas. Admittedly, this effect will be small since few dentists will desire multiple offices. However, if constraints on corporate ownership of dental practices and outside equity capital were relaxed, the increase in multiple offices would be greater.

There are strong legal, political, and economic trends acting to reshape state dental practice acts. In this article, those forces have been described and evaluated with respect to their probable effects on restrictions on advertising, dental auxiliary manpower and scope of function, and ownership and organization of dental practices, and the argument that these state laws have a significant influence on competition in dental services has been presented. Furthermore, to explain inconsistencies in the competitive effects of the various provisions of those laws is desirable. The most fruitful investigation of these state laws would be complemented by consideration of the professional code of ethics prevailing in each jurisdiction. More generally, the original rationale for certain practice act provisions may not apply in specific instances, and thus a time-series evaluation of changes in practice act provisions, and their effects, would be a particularly valuable piece of empirical research.

Notes

1. Indiana Dental Association, Indianapolis District Dental Society, Virginia Dental Association, Northern Virginia Dental Society. The litigation regarding this complaint has not yet been completed.
2. "FTC Challenges Competitive Restraints by Dental Associations," FTC News, January 14, 1977, p. 1.
3. Robert W. Merry, "Amid the Gnashing of Teeth, Dentists Start to Advertise," *Wall Street Journal,* November 30, 1977, p. 1.
4. *Goldfarb v. Virginia State Bar, 421* U.S. 2004 (1975).
5. *Virginia State Board of Pharmacy v. Virginia Citizens' Consumer Council,* 96 S.Ct. 1817 (1976).
6. *Bates v. State Bar of Arizona,* 97 S.Ct. 2691 (1977). It should be noted that the *Bates* decision specifically held that the Sherman Act did not apply in that case because of the state action exemption.
7. An extensive summary of this evidence and theory is presented in "Advertising of

Ophthalmic Goods and Services, *"Federal Register,* Vol. 43, No. 107 (June 2, 1978), pp. 23992–24008.

8. Ken Rankin, "The FTC's New Line on You," *Dental Management* 18 (January 1978): *33-38.*
9. The Supreme Court decision in ***Bates*** focused on ***price*** advertising, and advertising of quality was not addressed. Andrew Dolan has suggested an interesting point. Courts have displayed hostility to claims of superiority by providers. Notice, however, that price-cutters (the ones whom opponents of advertising would argue are likely to provide a lower quality of services) are not likely to claim superiority. Higher-priced dentists would need to claim some kind of superior quality to justify their higher fees. Since price-cutters are more likely to advertise, they will offer more objective information regarding quality (experience or training) without having to claim superiority.
10. See, for example, Alex Maurizi, ***Public Policy and the Dental Care Market*** (Washington, DC.: American Enterprise Institute, 1975), p. 65.
11. Most of the studies have been done in special settings; e.g., small-scale experiments, government clinics. One private practice study indicates that productivity rose when expanded duty dental assistants were added to the staffs of four dental offices. See Dale Redig et al., "Expanded Duty Dental Auxiliaries in Four Private Dental Offices," *Journal of the American Dental Association 88* (May 1974): 969–84.
12. The Internal Revenue Service has conferred exemption from federal income taxation on the ADA and the four other respondents to the FTC complaint. However, their exemption rests on Section 501 (c) (6) of the Internal Revenue Code, which covers associations of persons sharing common ***business*** interests. Hence, their character of membership and relationship with profit-oriented parties established FTC jurisdiction respecting these organizations. Clearly, tax code interpretations act as another cutting edge of the public challenge to professional control.
13. For a similar taxonomic design see L. E. Block, "The Advertising of Dental Services," *Dental Survey* 54 (March 1978): 12-18.
14. For the most recent estimates of dental care demand, see Willard G. Manning, Jr. and Charles E. Phelps, ***Dental Care Demand: Point Estimates and Implications for National Health Insurance,*** R-2157-HEW (Santa Monica: The Rand Corporation, March 1978). It should be pointed out that the authors found a reasonable price elasticity for dentures only for adult females.
15. Irvin Molotsky, "Dentists, Other Professionals Finding It Pays to Advertise," New *York Times,* January 17, 1978, p. 35.
16. For a description of this case, see "State Board Rules on Linda Krol Issue," *Journal of the California Dental Association 6* (July 1978): 13.
17. See Joseph Newhouse and Charles Phelps, "New Estimates of Price and Income Elasticities of Medical Care Services," in ***The Role of Health Insurance in the Health Services Sector,*** ed.: Richard N. Rosett (New York: National Bureau of Economic Research, 1976), pp. 261-313. Specifically, the dental demand study by Manning and Phelps, *Dental Care Demand,* confirmed this hypothesis.
18. Robert T. Holley and Rick J. Carlson, "The Legal Context for the Development of Health Maintenance Organization," *Stanford Law Review* 24 (April 1972): 644-86.
19. Council of State Governments, "Dental Health Care Delivery Systems." Background paper prepared for the National Task Force on State Dental Policies, 1978, Lexington, Kentucky, p. 13.
20. The 1970 fee and income figures used here are the cost-of-living adjusted figures used by Shepard in a recent study. His listing of states with vs. without reciprocity was also employed in the empirical results reported above. See Larry Shepard, "Licensure Restrictions and the Cost of Dental Care," *Journal of Law and Economics* 21 (April 1978): 187-201.
21. This general concept is developed in two articles: Lee Benham and Alexandra Benham, "Regulating Through the Professions: A Perspective on Information Control," *Journal of Law and Economics* 18 (October 1975): 421-43; and Lee Benham, "Guilds and the Form of Competition in the Health Care Sector," in *Competition in the Health Care Sector* (Washington, D.C.: Federal Trade Commission, 1978): 453-67.

Appendix. Ordinal Coding of State Dental Practice Act Provisions

Variable	Codes for Ranking Restrictions
(1) Office Limits (1970)	0 = no office limit 1 = multiple offices subject to Board approval 2 = limit to 1 office/dentist
(2) Number of Hygienists/ Dentist Limits (1970)	0 = no limit 1 = limit of 2 dental hygienists/dentist 2 = limit of 1 dental hygienist/dentist
(3) Restrictions on Auxiliary Delegation (1970)	0 = open practice act approach or allowed to delegate functions approved by Board 1 = all other provisions except those which provide only a serial list of what the hygienist can do 2 = provisions with serial listing of functions only
(4) Restrictions on Commercial Advertising	0 = advertising of price and terms of credit permitted 1 = advertising of price permitted where services/materials are constant 2 = advertising of availability of credit ***and*** use of newspaper and other public media to list dentist's name, location, degree, office hours, and phone number is permitted 3 = advertising availability of credit only permitted 4 = advertising in newspaper and other public media of name, location, etc., only permitted 5 = advertising a specialty ***and*** announcement of recent office opening or change of location permitted 6 = advertising a specialty only permitted 7 = announcement of recent office opening only permitted 8 = advertising limited to listing in phone and professional directories, appointment cards, professional cards, and door and window lettering and office display signs such information as name, location, degree, and office hours.

THE IMPACT OF INPUT REGULATION: THE CASE OF THE U.S. DENTAL INDUSTRY

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THE analysis of input restrictions has been in large part limited to the impact of union jurisdictional rules or occupational licensure.[1] There are, however, a significant number of cases where states have chosen to regulate the use of inputs in the production of particular products. Some examples include oyster harvesting, lobstering, medical practice, and dental practice. In some cases, these restrictions are justified on grounds of output limitation—for example, oyster harvesting and lobstering, in order to prevent "overproduction" due to common-property resource problems. In others, the regulations seem to be put in place to improve the returns to the residual income claimants in the industry being regulated—for example, medical and dental practices.

Our analysis considers both restrictions on employment and restrictions on the functions that may be performed by labor inputs. It is demonstrated that, for either case, if the restrictions are effective, the marginal

[1] In the case of union jurisdictional rules or apprenticeship requirements, recent examples include John M. Mattila & John Peter Mattila, Construction Apprenticeship in the Detroit Labor Market, 15 Indus. Rel. 99 (1976); and D. J. Lee, Craft Unions and the Force of Tradition: The Case of Apprenticeship, 17 Brit. J. Indus. Rel. 34 (1979). The existing literature on occupational licensing is extremely broad. In addition to general analyses, such as Thomas G. Moore, The Purpose of Licensing, 4 J. Law & Econ. 93 (1961), recent studies consider the impact of licensing construction workers: Jeffrey M. Perloff, The Impact of Licensing Laws on Wage Changes in the Construction Industry, 23 J. Law & Econ. 409 (1980); attorneys: B. Peter Pashigian, Occupational Licensing and the Interstate Mobility of Professionals, 22 J. Law & Econ. 1 (1979); physicians: Keith B. Leffler, Physician Licensure: Competition and Monopoly in American Medicine, 21 J. Law & Econ. 165 (1978); dentists: Lawrence Shepard, Licensing Restrictions and the Cost of Dental Care, 21 J. Law & Econ. 187 (1978); and clinical laboratory personnel: William D. White, The Impact of Occupational Licensure of Clinical Laboratory Personnel, 13 J. Human Resources 91 (1978).

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product of the unrestricted input will decline relative to that of the restricted input. Therefore, if such restrictions are effective, they would tend to increase the ratio of unrestricted to restricted inputs and increase the cost of services. Significantly, since our data are from the dental industry, our model includes customer time as an input. The inclusion of customer time is required for proper production function estimates, if significant waiting time is observed.

On the empirical level, we examine the effect of regulation of inputs using a sample of dental firms. In this analysis, we concentrate on the restrictions on employment and allowed functions of paradental inputs. Since the stringency of restrictions differs across states, we test our hypothesis by examining the differences in the ratio of the marginal products of the (unrestricted) dentist to the (restricted) paradentals in states that may be classified as restrictive or permissive. Our theoretical analysis requires that this ratio be lower in the more restrictive states, and our empirical results verify this relation. Regulation of paradental inputs does appear to have been effective in increasing dentist inputs relative to paradental inputs above the relative input usages that would have prevailed in an unregulated market.

I. Production in a Service Industry

Service industries such as medicine and dentistry require customer input for the delivery of the product. As a consequence, the output of the firm is a function of both firm-supplied inputs and customer-supplied inputs. For the following discussion it will be useful if we consider a separable production function. With this in mind consider a production function where output is the number of customers served, S, given that there are customers to be served. Denote this function as

$$S = S(K, X, R), \tag{1}$$

where K is the capital stock of the firm, X is the rate of use of the unrestricted input, and R is the rate of use of the restricted input. We can then treat S as the capacity of the firm.

The actual observations on output represent production at rate S when customers are available and production at a zero rate when customers are not available. Letting ρ be the proportion of the time the system is busy, we have that

$$Q = \rho S(K, X, R), \tag{2}$$

where Q is actual output. The expected proportion of the time the system

is busy (the capacity utilization rate) can, under fairly general conditions, be shown to be a function of the expected time customers spend waiting.[2] Denote this relation between the capacity utilization rate and customer waiting time, T, as

$$\rho = \rho(T). \tag{3}$$

The production function can now be written in terms of actual output as

$$Q = \rho(T)S(K, X, R) = A(K, X, R, T). \tag{4}$$

Since all the variables in (4) are observable, this function can be estimated from observable data. Customer time is a factor of production that allows the production function to be estimated; without it, efficient estimates of the production function in a service industry cannot be obtained.

II. The Effect of Input Restrictions

We have argued in the introduction that the regulations placed on the use of inputs in the medical and dental professions may be viewed as being put in place to improve the returns to the residual income claimants—that is, the doctors and dentists. Why would doctors and dentists want to impose restrictions on their own behavior? Two reasons related to returns to these professions are distinct possibilities. First, paramedical and paradental inputs may be substitutes for doctors and dentists. Restrictions on the use of these inputs will increase the demand for doctors and dentists and increase their returns.

The second explanation for self-imposed restrictions on input usage treats the paramedics and paradentics as complementary inputs. The dental industry is licensed so that some form of entry restriction is imposed. Given that entry is restricted, the practitioners can control the share of output going to each firm by restricting input usage. The single most important problem that a cartel must solve is the enforcement of the output restriction agreement. If each firm is restricted to an agreed-upon share of total inputs, then their output share is at least partially controlled. Thus, if a dental cartel existed, it could be in the interest of the cartel to restrict the use of inputs, particularly if the restriction takes the form of a limit on the quantity of a particular input per firm.

Restrictions on the use of inputs can be grouped into two categories—restrictions on the number employed and restrictions on the functions that may be performed. Binding restrictions on employment imply that $R \leqq \hat{R}$

[2] For example, in the single-server queuing model with no refusal to join lines and Markovian arrival and service processes $T = 1/(1 - \rho)$.

$< R^*$ where R^* is the desired rate of use and $\hat{R}$ is the restricted level. Restrictions on the functions that may be performed by the restricted input might best be illustrated in terms of apprenticeship rules in which the work of the apprentice must be supervised or inspected by the master. Such restrictions would take the form $R = \hat{\gamma}X$, where $\hat{\gamma}$ is the restriction on the level of usage of the restricted input (the apprentice) relative to that of the unrestricted input (the master). Binding restrictions imply $\hat{\gamma} < \gamma^*$, where γ^* is the output-maximizing ratio.

Defining W_K, W_X, and W_R to be the input prices, the required first-order conditions for output maximization with employment restrictions are[3]

$$\begin{aligned} \frac{\partial A}{\partial K} &= \lambda W_K, \\ \frac{\partial A}{\partial X} &= \lambda W_X, \\ R &= \hat{R}; \end{aligned} \tag{5}$$

and for function restrictions are

$$\begin{aligned} \frac{\partial A}{\partial K} &= \phi W_K, \\ \frac{\partial A}{\partial X} + \hat{\gamma}\frac{\partial A}{\partial R} &= \phi(W_X + \hat{\gamma}W_R), \\ R &= \hat{\gamma}X, \end{aligned} \tag{6}$$

where λ and ϕ are LaGrangian multipliers.

Both employment and function restrictions, if effective, increase the costs of service. The proof of this point follows from the envelope theorem and is easily shown. The effect of a relaxation of either restriction on costs for given output can be shown to be

$$\frac{\partial C}{\partial \hat{R}} = -\frac{1}{\lambda}\left(\frac{\partial A}{\partial R} - \lambda W_R\right) \tag{7}$$

[3] As long as the additional constraint introduced because of a restriction on factor i can be written in the form $G(X_i) \neq 0$, then the first-order conditions for all factors X_j, $i \neq j$, will be identical to the first-best condition. In general, it can be shown that only those factors included in the additional constraint made necessary by the restriction will have first-order conditions that differ from the first-best conditions. This is not to say, however, that the rates of use of all inputs are not affected by the reduction on the use of a proper subset of all factors. In general, factors will be affected. For an extensive discussion of this point, see Erik G. Furubotn & Thomas R. Saving, The Theory of the Second Best and the Efficiency of Marginal Cost Pricing, in Essays on Public Utility Pricing and Regulation (Harry M. Trebbing ed. 1971).

and

$$\frac{\partial C}{\partial \hat{\gamma}} = -\frac{X}{\phi}\left(\frac{\partial A}{\partial R} - \phi W_R\right). \tag{8}$$

If the restrictions are assumed to be binding, both $\partial A/\partial R - \lambda W_R$ and $\partial A/\partial R - \phi W_R$ would be positive; so, $\partial C/\partial \hat{R}$ and $\partial C/\partial \hat{\gamma}$ are strictly negative. Therefore, average costs fall when restrictions are relaxed. Given freedom of entry, lower average costs imply lower equilibrium marginal costs and hence lower equilibrium fees.[4]

Since $\hat{R} < R^*$, we have that $(\partial A/\partial R - \lambda W_R) > 0$ so that

$$\lambda < \frac{1}{W_R}\frac{\partial A}{\partial R}. \tag{9}$$

But since $(\partial A/\partial X - \lambda W_X) = 0$, we have

$$\frac{\partial A}{\partial X} - \left(\frac{1}{W_R}\frac{\partial A}{\partial R}\right) W_X < 0, \tag{10}$$

which implies

$$\frac{(\partial A/\partial X)}{(\partial A/\partial R)} < W_X/W_R. \tag{11}$$

Thus the marginal product of the unrestricted input will fall relative to the marginal product of the restricted input after restrictions are imposed on the level of employment.

In the case of function restriction, we have that $(\partial A/\partial R - \phi W_R) > 0$ and $(\partial A/\partial X - \phi W_X) < 0$ if $\hat{\gamma} < \gamma^*$. Accordingly, we have that

$$\phi < \frac{\partial A}{\partial R}\frac{1}{W_R}. \tag{12}$$

But, $(\partial A/\partial X - \phi W_X) < 0$; so,

$$\frac{\partial A}{\partial X} - \left(\frac{1}{W_R}\frac{\partial A}{\partial R}\right) W_X < 0, \tag{13}$$

which implies

$$\frac{(\partial A/\partial X)}{(\partial A/\partial R)} < W_X/W_R. \tag{14}$$

Thus both forms of restriction have the same effect on the marginal product of input X relative to the marginal product of input R.

[4] Freedom of entry with no external diseconomies of scale will result, in equilibrium, in the price being equal to the minimum average cost of supplying constant quality output. Thus, any change that reduces cost will, in the long run, reduce fees.

III. An Empirical Analysis: The Case of the U.S. Dental Industry[5]

In order to examine empirically the proposition developed in the preceding section, we will use data drawn from the U.S. dental industry. The restrictions placed on the use of paradental inputs at the state level can be conveniently placed in the following categories:[6] (1) restrictions on the number of paradentists; (2) restrictions on the minimum amount of dentist input per service rendered; and (3) restrictions on the maximum amount of paradentist input per service rendered. Using the grouping described in the preceding section, category 1 is a restriction on employment, whereas categories 2 and 3 are restrictions on function.

States are not uniform in the restrictions imposed; states that are highly restrictive should differ from the less restrictive states in the estimated marginal products of paradentals relative to dentists. In particular, less restrictive states should have relative (to dentists) paradental marginal products that are lower than those in the restrictive states.[7]

Our data were obtained from the American Dental Association's *Survey of Dental Practice, 1977*. To make our sample as homogeneous as possible, both in the sense of output and the production process, we excluded those dentists with the following characteristics: specialists; those salaried or in a partnership or incorporated practice; those who employed dental laboratory technicians; those who did not practice for the entire year; those sharing costs with another practice or business; those with no full-time experience; and those who practiced in more than one location or outside the continental United States. These exclusions limit our analysis to dentists practicing general dentistry in private-practice, one-dentist offices. The resulting sample is made up of 447 observations.

To obtain estimates of equation (4) we employed the transcendental production function used by Reinhardt for physician services and by Boulier and by Scheffler and Kushman for dentist services.[8] Specifically, we define the production function to be

$$Q = AK^{\alpha_1}D^{\alpha_2}e^{\beta_1 K+\beta_2 D}e^{\Sigma\gamma_i l_i+\Sigma\theta_i l_i^2}e^{\psi_1 N_1}e^{\psi_2 N_2+\psi_3 N_2^2}e^{\psi_4 T}, \tag{15}$$

where

[5] This paper summarizes an extensive empirical analysis. A more complete description of the empirical research is available from the authors upon request.

[6] See Donald R. House, The Economic Relationship between Dentist's Income and Time Supplied, USDHEW, Contract HRA 231-77-0117 (1978).

[7] That is, assuming that all factors are normal; see Charles E. Ferguson & Thomas R. Saving, Long-Run Scale Adjustments of a Perfectly Competitive Firm and Industry, 59 Am. Econ. Rev. 776 (1969).

[8] Uwe Reinhardt, A Production Function for Physician Services, 54 Rev. Econ. & Stat.

Q = patients treated per week,

K = number of operatories (capital),

D = dentist hours per week treating patients,

X_1 = dentist nontreatment hours per week,

X_2 = years experience of dentist,

L_1 = number of dental hygienists (in full-time equivalents),[9]

L_2 = number of chairside assistants (in full-time equivalents),

L_3 = number of clerical personnel (in full-time equivalents),[10] and

T = mean waiting time in office (in minutes).[11]

In all instances, this function was estimated using ordinary least squares.[12]

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55 (1972); Bryan L. Boulier, Two Essays in the Economics of Dentistry: A Production Function for Dental Services and an Examination of the Effects of Licensure (May 1974) (unpublished Ph.D. dissertation, Princeton Univ.); Richard M. Scheffler & John E. Kushman, A Production Function for Dental Services: Estimation and Economic Implications, 44 S. Econ. J. 25 (1977). For a discussion of the properties of the transcendental production function, refer to the paper by A. N. Halter, H. O. Carter, & J. G. Hocking, A Note on the Transcendental Production Function, 39 J. Farm Econ. 966 (1957).

[9] Specifically, we employed an arbitrary forty-hour week and fifty-two-week work year. Then the full-time equivalent of auxiliary j employed by firm k is

$$L_{j,k} = \left[\sum^{i} \left(\frac{\text{months employed}_i}{12}\right) \cdot 52 \cdot \text{hours per week}\right] \Big/ 2{,}080,$$

where i is the number of auxiliaries of type j employed.

[10] The clerical personnel included both secretary-receptionists and bookkeepers. In our preliminary estimations, we also included as an explanatory variable the mean experience of each type of auxiliary. While this variable was never significant, it was interesting to note that the estimated magnitudes were as would have been predicted. That is, the experience of the chairside assistant had the largest impact, followed by the experience of the clerical personnel and by the hygienist. This definitely conforms to the fact that the chairside assistant is trained within the firm, whereas the hygienist receives formal training outside the practice.

[11] In our analysis we also measured waiting time as waiting time for an appointment (in days). The results using this alternative were basically the same as those reported in this paper.

[12] Jacob Marschak & William Andrews (Random Simultaneous Equations and the Theory of Production, 12 Econometrica 143 [1944]) argued that both input and output are jointly determined endogenous variables. This has led many, including Marc Nerlove, Estimation and Identification of Cobb-Douglas Production Functions (1965), to the conclusion that ordinary least-squares estimation of a production function (specifically a Cobb-Douglas production function) would yield biased and inconsistent parameter estimates. However, a point recognized by Irving Hoch (Simultaneous Equations Bias in the Context of the Cobb-Douglas Production Function, 26 Econometrica 566 [1958]) and Yair Mundlak & Irving

As we have shown in our theoretical discussion, legal restrictions will, if effective, result in a reduction in usage of the restricted factors relative to the unrestricted factors. Before proceeding to an examination of the employment and function restrictions, it is perhaps advisable to determine whether evidence of underutilization of paradental inputs exists in our total sample. In a sense, this analysis of the full sample will set the stage for our subsequent analyses. If we want to show that input regulations are responsible for inefficiency, it is first necessary to determine whether the data set as a whole exhibits the presence of inefficiency in input usage.

If the firms are minimizing cost, the ratios of the marginal product of the input to its cost should be equal for all inputs. However, since we have no data on the user cost of capital or dentists, we will confine ourselves primarily to consideration of the hypothesis

$$\frac{MP_1}{W_1} = \frac{MP_2}{W_2} = \frac{MP_3}{W_3}, \tag{16}$$

where MP_i and W_i are, respectively, the marginal product and wage rate of the ith auxiliary. Since legal restrictions are imposed on dental hygienists (L_1) and chairside assistants (L_2) rather than on clerical personnel (L_3), underutilization of L_1 and L_2 would require $MP_1/W_1 > MP_3/W_3$ and $MP_2/W_2 > MP_3/W_3$.

Using the estimates of the production function (15) for the 447 observations in our sample, we calculated estimates of the marginal products of capital, dentist hours, and the auxiliaries.[13] We also calculated the

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Hoch (Consequences of Alternative Specifications in Estimation of Cobb-Douglas Production Functions, 33 Econometrica 814 [1965]) and demonstrated rigorously by Arnold Zellner, Jan Kmenta, & Jacques Dreze (Specification and Estimation of Cobb-Douglas Production Function Models, 34 Econometrica 784 [1966]) is that, if the entrepreneurial maximand is a stochastic variable, the ordinary least-squares estimates are unbiased and consistent. Our model certainly satisfies that criterion since actual output is a random variable. An excellent discussion of the point can be found in John R. Moroney, The Structure of Production in American Manufacturing (1972). Furthermore, even if the maximand is not stochastic, Hoch demonstrated that the bias from ordinary least-squares estimation is small if the firms (in our case dentists) face different product and factor prices and if they differ substantially in their willingness or ability to choose inputs and outputs. Reinhardt, *supra* note 8, used this construct in his examination of private medical practices. He argued that the conditions are characteristic of private physicians. Examination of our data set indicates that these conditions would also appear to be characteristic of private dental practices.

[13] The estimated marginal products are

$$Q_K = \left(\frac{\alpha_1}{K} + \beta_1\right)Q,$$

$$Q_D = \left(\frac{\alpha_2}{D} + \beta_2\right)Q,$$

$$Q_{L_i} = (\gamma_i + 2\theta_i L_i)Q.$$

These expressions were evaluated at the sample means.

TABLE 1
COST MINIMIZATION—VARIANT 1

	K	D	L_1	L_2	L_3
Marginal products	.60680 (1.95470)	1.31161 (.19676)	31.00237 (5.24394)	11.44455 (2.54850)	3.99162 (2.69063)
Rates of change of marginal product	−2.77390	−.02704	14.25369	10.04089	−17.47153
Mean wage rates	. . .	. . .	290.73	139.05	150.79
Marginal product / Mean wage rate	. . .	. . .	.1066 (.0180)	.0823 (.0183)	(.0266) (.0179)

NOTE.—Asymptotic standard errors are in parentheses.

asymptotic standard errors for these estimates[14] and the rates of change of the marginal products,[15] again using our production function estimates as data. The mean weekly wage rates of hygienists, chairside assistants, and clerical personnel were calculated from the sample by converting the wages received by any part-time employees to a full-time basis. Finally, the ratios of the marginal product of a factor to that factor's wage rate were calculated treating the wage rate as a constant. These estimates are displayed in Table 1.

These results indicate that the dental firms are underutilizing hygienists and chairside assistants relative to their cost-minimizing levels. These estimates indicate that both MP_1/W_1 and MP_2/W_2 are greater than MP_3/W_3. This conclusion is also supported by the fact that the estimated rate of change of the marginal products of hygienists and chairside assis-

[14] Using the technique suggested by Lawrence R. Klein in Textbook of Econometrics (1953) at 258, asymptotic variances for the estimated marginal products are

$$\text{Asym Var}\,(Q_K) = Q^2\left[\frac{\text{Var}\,(\alpha_1)}{K^2} + \text{Var}\,(\beta_1) + \frac{2\,\text{Cov}\,(\alpha_1\beta_1)}{K}\right],$$

$$\text{Asym Var}\,(Q_D) = Q^2\left[\frac{\text{Var}\,(\alpha_2)}{D^2} + \text{Var}\,(\beta_2) + \frac{2\,\text{Cov}\,(\alpha_2\beta_2)}{D}\right],$$

$$\text{Asym Var}\,(Q_{L_i}) = Q^2[\text{Var}\,(\gamma_i) + 4L_i\text{Var}\,(\theta_i) + 4L_i\text{Cov}\,(\gamma_i\theta_i)].$$

[15] The rates of change (that is, second derivatives) are

$$Q_{KK} = \left[\left(\frac{\alpha_1}{K} + \beta_1\right)^2 - \frac{\alpha_1}{K}\right]Q,$$

$$Q_{DD} = \left[\left(\frac{\alpha_2}{D} + \beta_2\right)^2 - \frac{\alpha_2}{D}\right]Q,$$

$$Q_{L_iL_i} = [(\gamma_i + 2\theta_iL_i)^2 + 2\theta_i]Q.$$

Again, the mean values of the variables were employed.

tants are both positive at their present levels of employment; so the restricted factors have increasing marginal products.

The preceding test is not decisive because the wage rates used may be confounded by differences in price levels. We can improve the test by considering relative wages. Within each firm, calculate the hygienist's and chairside assistant's wage relative to that of clerical personnel,

$$\omega_1 = W_1/W_3, \qquad \omega_2 = W_2/W_3. \tag{17}$$

Then, using the sample means for these relative wage rates, ω_1 and ω_2, our hypotheses become

$$MP_1/MP_3 = \omega_1 \quad \text{and} \quad MP_2/MP_3 = \omega_2. \tag{18}$$

This test requires that we further restrict our sample to exclude those practices that employ hygienists and/or chairside assistants but no clerical personnel. This restriction reduced the sample to 359 observations.

Using the reduced sample, we again estimated the production function (15). Then we used the estimates obtained to calculate estimates for the marginal products of the inputs, asymptotic standard errors for the marginal products, and the rates of change of the marginal products.[16] Within this reduced sample, we next calculated the mean relative wage rates as described in (17). Finally, we calculated the ratios of the marginal products of the hygienists and chairside assistants to that of the clerical personnel—that is, MP_1/MP_3 and MP_2/MP_3—and the corresponding asymptotic standard errors.[17] These estimates are displayed in Table 2. These results again indicate that the dental firms are restrained from the cost-minimizing levels of L_1 and L_2; that is, both MP_1/MP_3 and MP_2/MP_3 are significantly greater than the respective relative wage rates. As in the preceding test, this evidence indicates that hygienists and chairside assistants are underutilized.

[16] See notes 13–15 *supra*.

[17] From note 13 *supra:*

$$\frac{Q_{L_i}}{Q_{L_j}} = \frac{\gamma_i + 2\theta_i L_i}{\gamma_j + 2\theta_j L_j};$$

so, the asymptotic variance is

$$\text{Asym Var}\left(\frac{Q_{L_i}}{Q_{L_j}}\right) = \frac{\text{Var}\,(Q_{L_i})}{Q^2} + \left(\frac{Q_{L_i}}{Q_{L_i}}\right)^2 \frac{\text{Var}\,(Q_{L_i})}{Q^2} - 2\frac{Q_{L_i}}{Q_{L_j}} \text{Cov}\,(\gamma_i\gamma_j) + 2L_j \text{Cov}\,(\gamma_i\theta_j) + 2L_i \text{Cov}\,(\theta_i\gamma_j) + 4L_iL_j \text{Cov}\,(\theta_i\theta_j).$$

TABLE 2
COST MINIMIZATION—VARIANT 2

	K	D	L_1	L_2	L_3
Marginal products	−.74264 (2.00208)	1.29711 (.20187)	29.68642 (5.08289)	13.47412 (2.98772)	.15349 (3.65725)
Rates of change	−1.79771	−.04382	18.43956	7.69466	−15.30356
			ω_1	ω_2	
Relative wage rates (mean)	. . .	. . .	2.0729 MP_1/MP_3	.9794 MP_2/MP_3	. . .
Ratios of marginal products	. . .	. . .	193.41070 (9.18187)	87.78563 (4.17649)	. . .

NOTE.—Asymptotic standard errors are in parentheses.

The preceding evidence is consistent with our discussion of the impact of the legal restriction. However, it is quite possible that the apparent underutilization of the restricted inputs could be the result of other factors. Hence, a more direct test is desirable to determine if the legal restrictions are effective. As we demonstrated in our theoretical discussion, if legal restrictions are effective, the marginal product of the dentist will fall relative to that of the restricted auxiliary. This hypothesis can be examined by partitioning our sample into states with strong, binding restrictions (restrictive states) and states with weak, possibly nonbinding restrictions (permissive states). For a correct partition, theory implies the hypothesis:

$$(MP_D/MP_A)_{\text{restrictive}} < (MP_D/MP_A)_{\text{permissive}}.$$

Restrictions on auxiliary function have been discussed by Lipscomb and by Battalio, House, and Kagel, and restrictive/permissive partitions of states are made in both studies.[18] In our analysis, the intersection of these partitions was employed. A state was considered to be permissive or restrictive only if both of the preceding studies classified it as permissive or restrictive. Any state for which there was disagreement about classification was excluded from our sample. The states with permissive regulations on auxiliary function, on the basis of our criteria, were Kentucky, Ohio, Indiana, Colorado, and Pennsylvania. The restrictive states were Illinois, New Jersey, Michigan, District of Columbia, and New York. Those states classified differently by the studies and therefore ex-

[18] Joseph Lipscomb, Legal Restrictions on Input Substitution in Dentistry: An Activity Analysis Approach (October 1977) (mimeographed, Duke Univ.); Raymond C. Battalio, Donald R. House, & John H. Kagel, An Empirical Analysis of the Impact of State Legal Restrictions on Paraprofessionals in the Dental Industry (1979) (unpublished manuscript, Resource Research Corp., Bryan, Texas).

cluded are North Dakota, Maine, Rhode Island, New Mexico, Utah, South Dakota, and Vermont.

The permissive/restrictive states according to limits on employment of auxiliaries are classified by House.[19] The most restrictive group includes California, which permits no more than two auxiliaries per dentist, and four other states that permit no more than one hygienist per dentist—New Mexico, North Carolina, Oklahoma, and Virginia. A less restrictive group is made up of those states that permit no more than two hygienists per dentist—the District of Columbia, Florida, Illinois, Kentucky, Ohio, Oregon, Texas, and Washington. All other states were classified as permissive.

From the preceding, we have two methods of partitioning our sample of 447 observations. First, considering restrictions on function, our restrictive group contains 124 observations, and the permissive group contains 301 observations. Note that 22 observations were excluded because of the inability to classify the state, as noted above. Second, with respect to restrictions on employment, our restrictive group contains 172 observations, and the permissive group contains 275 observations. For each of these four subsamples, we estimated our production function (15) and then used the resulting parameter estimates to obtain estimates of the marginal products of the inputs and asymptotic standard errors.[20] Note that, in each of the subsamples, the marginal products were estimated using the relevant subsample means for the variables (for example, the marginal products for the restrictive grouping by function were estimated using the mean values for that group of 124 observations). We then used these estimates to obtain the ratios of the marginal products of the dentist and each type of auxiliary—that is, MP_D/MP_A. Since the restrictions primarily affect hygienists (L_1) and chairside assistants (L_2), we limited our attention to these auxiliaries. These estimates are presented in Table 3.

Examination of Table 3 indicates that regulation does appear to be effective. While covariances are not available, the estimates indicate that the ratio of the marginal product of dentists to auxiliaries is smaller in the restrictive states than in the permissive states, whether the classification is made by restriction on function or number employed.

The effect of restrictions on allowed function is limited to chairside assistants. This suggests it is the chairside assistant who would most often be used in expanded functions. The contention is borne out by our estimation of the Allen partial elasticities of substitution. These estimates,

[19] House, *supra* note 6.

[20] See notes 13 & 14 *supra*.

TABLE 3
EFFECT OF LEGAL RESTRICTIONS

	$\frac{MP_D}{MP_1}$	$\frac{MP_D}{MP_2}$
Restrictions on function:		
Restrictive	.04282	.07083
	(.00863)	(.00733)
Permissive	.04400	.18452
	(.00510)	(.00882)
Restrictions on employment:		
Restrictive	.02676	.08180
	(.00584)	(.00713)
Permissive	.05326	.13820
	(.00588)	(.00692)

NOTE.—Asymptotic standard errors are in parentheses.

shown in Table 4, indicate that the dentist and the hygienist are substitutes while the dentist and the chairside assistant are complements.

In the case of restrictions on employment, our estimates indicate that both auxiliaries are affected. This result is somewhat surprising since employment limitations are generally imposed on hygienists (except in California). However, estimates using only the most restrictive states indicate an effect on hygienists but failed to show any effect on chairside assistants.[21] Hence, in the case of restrictions on employment, our estimates indicate that they do result in underutilization of hygienists, but their effect on the utilization of chairside assistants is sensitive to the partition of the sample, with the most reasonable partition indicating no effect.

The segmented samples provided an additional piece of evidence that supports the contention that restrictions on use of auxiliaries do limit their use relative to their cost-minimizing levels. We reestimated the production functions using the smaller sample that included only those practices that employed all three types of auxiliary personnel. We calculated the ratios of the marginal products and the mean relative wage rates, as described earlier.[22] On comparison, only one of the classifications

[21] For the most restrictive group,

$$\frac{MP_D}{MP_2} = \underset{(0.01932)}{0.16486}$$

This ratio cannot be shown to be significantly different from the estimate for the permissive group.

[22] Using this smaller sample, we also calculated the ratios of the marginal product of the dentist to that of the restricted auxiliary for each of the segmented samples. The results were basically the same as those reported in Table 3.

TABLE 4
ESTIMATED ALLEN PARTIAL ELASTICITIES OF SUBSTITUTION

	D	L_1	L_2	L_3
K	.09645	.11052	.10794	.12519
D		5.30489	−3.52440	.34806
L_1			−3.45541	.45073
L_2				.45236

satisfied the cost-minimization conditions—that group of states with permissive restrictions on the allowed functions of auxiliaries. The estimates for this group were

$$\frac{MP_1}{MP_3} = \underset{(0.41656)}{2.12890} \qquad \omega_1 = \underset{(0.4306)}{2.0213}$$

$$\frac{MP_2}{MP_3} = \underset{(0.19863)}{0.73953} \qquad \omega_2 = \underset{(0.1794)}{0.9910}.$$

Clearly, for these estimates it is impossible to reject the hypothesis that firms in these permissive states are minimizing cost.

IV. CONCLUDING REMARKS

In this paper, we have provided a theoretical discussion of and empirical evidence relating to the impact of legal restrictions on input usage. In this section we will briefly review our findings as well as note their implications.

In our analysis we considered legal restrictions on input quantities and functions that an input may perform. Our theoretical analysis demonstrated that, in either case, legal restrictions, if effective, would reduce the marginal product of the unrestricted input relative to that of the restricted input.

In our empirical analysis of legal restrictions, we used an extensive sample of U.S. dental firms. We first presented evidence, using the entire sample of dental firms, that is consistent with the hypothesized underutilization of restricted paradental inputs. More to the point, however, we segmented our sample by states that may be regarded as permissive or restrictive with respect to legal restrictions and demonstrated that the ratio of the marginal product of the dentist to that of the restricted paradental input is lower in the restrictive states than in the permissive states—precisely the result predicted. Furthermore, it was found that the

cost-minimizing conditions are satisfied only in those states that permit the widest latitude on the functions that may be performed by the paradentists. This finding is also further indirect evidence that dental firms maximize profits.

The results of this work indicate that the state legal restrictions on the use of paradentals have resulted in a dentist-paradentist labor input ratio that is higher than it would be without the legal restrictions. This increase in the relative use of dentist time increases average costs. If dentistry is characterized by freedom of entry, the increase in average cost would result in higher fees in the restrictive states.

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Occupational Licensing

Morris M. Kleiner

The study of the regulation of occupations has a long and distinguished tradition in economics.

Occupational regulation was discussed by Adam Smith (1776 [1937]) in the *Wealth of Nations* (Book I, Ch. 10, Part II), where he focuses on the ability of the crafts to lengthen apprenticeship programs and limit the number of apprentices per master, thus ensuring higher earnings for persons in these occupations.

> The patrimony of a poor man lies in the strength and dexterity of his hands; and to hinder him from employing this strength and dexterity in what manner he thinks proper without injury to his neighbor, is a plain violation of this most sacred property. It is a manifest encroachment upon the just liberty both of the workman, and of those who might be disposed to employ him. As it hinders the one from working at what he thinks proper, so it hinders the others from employing whom they think proper. To judge whether he is fit to be employed, may surely be trusted to the discretion of the employers whose interest it so much concerns. The affected anxiety of the law-giver lest they should employ an improper person, is evidently as impertinent as it is oppressive. The institution of long apprenticeships can give no security that insufficient workmanship shall not frequently be exposed to public sale.

Smith states that long apprenticeships are no assurance of quality, nor are they useful in inculcating industriousness among workers. Instead, he argues, they serve

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only to "prevent this reduction of price, and consequently of wages and profit, by restraining that free competition which would most certainly occasion it."

In a 1945 volume published by the National Bureau of Economic Research, which was largely based on Milton Friedman's dissertation, Friedman and Simon Kuznets suggested that the issue of occupational regulation continued to be of long-standing interest in economics. Friedman and Kuznets (p. 12) related, "In all professions, there has developed in the last few years an aristocratic, or at least a restrictive movement which, in a sense, is reminiscent of the medieval guilds." In the early 1960s, a volume summarizing the most important research issues in labor economics focused its lead article on the subject of occupational licensing (Lewis, 1962).

But even though occupational licensing has historically been among the most examined institutions in labor economics, this institution has received relatively little recent attention, either from academics or the public policy press. An examination of the *American Economic Review*, *Journal of Political Economy* and the *Quarterly Journal of Economics* found no articles published in these journals on occupational licensing during the past five years.

The neglect of occupational licensing does not seem to have occurred because the practice has dwindled to a negligible amount. Occupational licensing directly affects approximately 18 percent of U.S. workers, which is more than either the minimum wage, which has a direct impact on less than 10 percent of workers (even though it covers most of the workforce), or unionization, whose membership rates are now less than 15 percent of the labor force (Kleiner, 1990; Wheelen, 1999). Moreover, while unions have declined from representing approximately 30 percent of the labor force in the 1950s to less than 15 percent in 1999, the percentage of workers who are covered by either state or local licenses continues to rise as the demand for regulated services grows and more occupations become regulated. However, while unions and the minimum wage have been among the most researched institutions within labor economics during the past decade, the study of occupational licensing has gone into partial eclipse.

Table 1 presents employment for five major occupations in which there is state licensing within the occupation from the 1990 Census. These five occupations alone total nearly 10 million workers. Although not all the persons in these occupations require a license to perform their work, the most difficult and economically rewarding tasks generally require a state license. The Council of State Governments lists more than 800 occupations as licensed in at least one state, ranging from fortune-tellers in Maryland to rainmakers in Arizona (Council of State Governments, 1994).

Anecdotes abound in the popular press about the unintended consequences of occupational licensing. There are examples of persons who gave themselves root canals rather than going to an expensive dentist (Rademacher, 1997),[1] and exam-

[1] I thank Charles Brown for providing this example to me.

Table 1
Number of Persons in Major Licensed Occupations

Occupation	*Number of Persons Who Worked in the Occupation*
Teachers	3,588,317
Nurses	2,269,695
Engineers	1,682,902
Accountants and Auditors	1,565,359
Lawyers and Judges	770,789

Source: 1990 Public Use Sample Census Data

ples of licensed painters who would lose their license to paint by doing only one rather than four walls of a room—regardless of the desires of the customer (Daly, 1996). Even among licensed occupations, there are conflicts about who gets to do the work. For example, dentist's organizations have attempted creative political and legal maneuvers to block licensed dental hygienists from opening independent shops without the supervision of a licensed dentist (Rundle, 1987).

In this paper, I present the central arguments and unresolved issues involving the costs and benefits of occupational licensing. Occupational licensing is defined as a process where entry into an occupation requires the permission of the government, and the state requires some demonstration of a minimum degree of competency. The state usually creates a nongovernmental licensing board with political appointees, public members and members of the occupation to oversee the regulated occupations. Generally, members of the occupation dominate the licensing boards. The agency must usually be self-supporting by collecting fees and registration charges from persons in the licensed occupations. Usually, members of the occupation provide technical support to the licensing agency.

It is useful to contrast occupational licensing with certification. A certification permits any person to perform the relevant tasks, but the government agency administers an examination and certifies those who have passed and the level of skill or knowledge (Rottenberg, 1980). Consumers of the product or service can then choose whether to hire a certified worker or not. In the case of occupational licensing, it is illegal for anyone without a license to perform the task. For example, travel agents and mechanics are generally certified, but not licensed.

The main benefits that are suggested for occupational licensing involve improving quality for those persons receiving the service. Occupational licensure creates a greater incentive for individuals to invest in more occupation-specific human capital because they will be more able to recoup the full returns to their investment if they need not face low-quality substitutes for their services (Akerlof, 1970; Shapiro, 1986). Under these conditions, some sectors of the market divided by income or quality for the services may benefit more than others, which is what

Shapiro calls a "separating equilibrium." The existence of licenses may minimize consumer uncertainty over the quality of the licensed service and increase the overall demand for the service (Arrow, 1971). Moreover, it is argued that in some cases, a poor quality service is not just a matter between employer and employee. A doctor who makes a bad diagnosis may cause a widespread epidemic. A boilermaker who installs a furnace incorrectly may cause a building to catch fire, injuring or killing many persons. In this sense, requiring a practitioner to be trained at a minimum level recognizes a form of regulation which may produce positive social payoffs.

Skeptics of occupational licensing point out that the empirical evidence on the increase in quality, greater level of training, or avoidance of catastrophes is often thin or nonexistent. They argue that if a signal of quality is important, certification is a better way of accomplishing the goal than occupational licensing. Moreover, the skeptics argue that any remaining beneficial effects of occupational licensing are more than offset by the monopoly effects of restriction of supply of practitioners.

Supply-side Effects of Occupational Licensing

How Licensing Constricts Labor Supply

The most generally held view on the economics of occupational licensing is that it restricts the supply of labor to the occupation and thereby drives up the price of labor as well as of services rendered (Rottenberg, 1980). State-regulated occupations can use political institutions such as state legislatures or city councils to control initial entry and in-migration, and thereby restrict supply and raise the wages of the licensed practitioner. There is presumed to be a once-and-for-all income gain that accrues to current members of the occupation who are grandparented in, because they do not have to meet the newly established standard (Perloff, 1980). Individuals who attempt to enter the occupation in the future will need to balance the economic rents of the field's increased monopoly power against the greater difficulty of meeting the entrance requirements.

Once an occupation is regulated, members of that occupation in a geographic or political jurisdiction can implement tougher statutes or examination pass rates and may gain relative to those who have easier requirements by further restricting the supply of labor and obtaining economic rents for incumbents (Kleiner, 1990). Restrictions would include lowering the pass rate on the licensing exam, imposing both higher general and specific education requirements, and implementing tougher residency requirements that limit new arrivals in the area from qualifying for a license. Indeed, individuals who have finished schooling in the occupation may decide not to go to a particular political jurisdiction where the pass rate is low because both the economic and shame costs may be high (Kandel and Lazear,

1992). Of course, the individuals who take a test in Mississippi may have different qualifications and abilities than someone in California. Consequently, any analysis of pass rate effects need to be tempered with some controls for the academic quality of the test-takers both across states and over time. One additional effect of licensing is for individuals who are not allowed to practice at all in an occupation as a consequence of regulation. They may then enter a nonlicensed occupation, shifting the supply curve outward and driving down wages in these nonregulated occupations.

The costs of failing a licensing exam, for example, in dentistry is the estimated present value cost of failing the exam, which was $54,000 in 1997 dollars when reduced earnings growth, lost experience, and nominal earnings growth differences are accounted for over time (Kleiner and Kudrle, 2000). Long residency requirements or the necessity of retaking parts of the new sections of the original licensing exam further impede geographic mobility across states or local jurisdictions (Kleiner, Gay and Greene, 1982). Florida, Arizona and California have traditionally had longer continuous residency requirements for many regulated occupations, presumably to keep persons from states with more inclement weather from moving to the state and working in the occupation during the winter months (Shimberg, Esser and Kruger, 1973). Other states focus on unique parts of an occupation, such as the "gold foil" method of filling teeth in California, that are only examined within their state's licensing exam.

The restrictions of supply involved in occupational licensing have led to charges that licensing results in discrimination against historically disadvantaged minority groups (Williams, 1982). A disproportionate impact on minority groups might occur either because minorities have a disproportionately difficult time in passing the licensing examinations, or because minorities are underrepresented among the incumbents within occupations who are protected by licensing. However, the limited evidence shows little effect of licensing on restricting African-Americans from the traditionally regulated occupations (Freeman, 1980).

Parallels to Unions

When an occupation becomes regulated, there are some similarities to union limitations on entry at the firm level (Freeman and Medoff, 1984). Where management agrees to a union shop provision as part of a collective bargaining agreement, generally only members of the union can be employed at that workplace doing certain tasks. This presumably increases the economic leverage of the union, and also may contribute to the more than 20 percent wage premium received by union members (Lewis, 1986). However, recent evidence on the union effects shortly following an organizing drive shows that unions have a modest effect on wages in newly organized establishments, and the same gradual increase in earnings also may be true of persons in licensed occupations (Freeman and Kleiner, 1990). No analysis of this issue has been undertaken for licensed occupations.

One major difference between occupational licensing and unions is that licensing may be a more secure job classification. It is rare either for an occupation to become deregulated by a government agency, or for the regulatory powers of a licensing board to be stripped by the legislature, or for the licensing board to ask to be terminated. One rare example: the occupational licensing of watchmakers was eliminated in Minnesota when the number of persons in the occupation in the state dropped to less than 100. In contrast, unions can be and are decertified as representatives of employees in National Labor Relations Board elections. Annually, hundreds of decertification elections are conducted in the private sector, and unions lose more than half of these elections (Fossum, 1999).

Evidence on Wage Premiums and Employment

Table 2 presents some illustrative evidence on the effects of occupational licensing on wage premiums and employment. The table shows total earnings, hourly earnings, and employment growth of persons in four occupations that are licensed across the United States, each compared with some unlicensed occupations that are listed in the Census as in the same job family category, which means that they include similar education and job requirements. The universally licensed occupations are dentists, lawyers, barbers, and cosmetologists.[2] To work in these occupations, *all* persons must have a license. This is in contrast to jobs like teachers or accountants, where most persons in the occupation are regulated by type of job performed within the occupation, but not all. The four licensed occupations in Table 2 reflect occupations for which there is considerable variation among the states in the statutes and pass rates governing entrance into the jobs.

Column one of Table 2 shows the average annual total earnings in the occupation from the 1990 Public Use Sample from the Census Bureau (the 5 percent sample), including only persons who worked more than 20 hours for pay per week in the given occupations. Columns one and two show the annual earnings and the hourly earnings of persons in these occupations. Column three shows the log average hourly earnings of licensed relative to the listed nonlicensed occupations. Of course, wages in these occupational categories may differ because of differences in human capital characteristics.

I also present a residual wage gap analysis of what these persons would have earned if they had been in a nonregulated occupation in column three. To do this, a human capital model using multivariate techniques that included earnings as a function of age, age-squared, education, race, gender, and whether the person was

[2] The four licensed occupations in Table 2 are included as part of a project to examine the labor market effects of licensing in the United States and major European Union countries (Kleiner, 2000). Additional comparisons of these four occupations with others in the same Census category, not shown here, produced results similar to the ones presented in Table 2.

Table 2
Earnings and Employment Change in Selected Licensed and Nonlicensed Occupations

Occupation	*Total Earnings*	*Earnings per Hour*	*Log difference in per Hour*		*% Change in Employment*
			Log of Actual Difference	*Difference due to Licensing*	
Dentists	$82,976	$38.87			20
Chemists, except Biochemists	$38,532	$17.61	0.72	0.29	28
Biological and Life Scientists	$32,373	$14.91	0.91	0.45	28
Lawyers	$76,513	$28.51			40
Personnel, Training and Labor Relations Specialists	$31,029	$14.12	0.73	0.20	25
Economists	$45,424	$19.72	0.94	0.02	38
Barbers	$18,667	$ 7.73			−22
Bartenders	$12,960	$ 7.51	0.16	−0.01	01
Welfare Service Aides	$14,653	$ 8.13	0.04	−0.12	−21
Hairdressers and Cosmetologists	$13,473	$ 7.29			33
Bartenders	$12,960	$ 7.51	−0.05	0.07	01
Health Aides, except Nursing	$14,448	$ 7.95	−0.12	−0.08	−22

Source: Integrated Public Use Microdata Series: Version 2.0, Minneapolis: Historical Census Projects
Note: Excludes Postsecondary Educators

a U.S. citizen is estimated. Age-squared is included to account for the fact that earnings decline in a nonlinear manner over time. Citizenship also is included since it has historically been used as a criterion for entering regulated occupations.[3]

[3] I estimate the effects of the usual human capital variables for both nonregulated and regulated occupations as follows:

$$W_L = \alpha_L + \Sigma\beta_{jL}X_{jL}$$

$$W_{NL} = \alpha_{NL} + \Sigma\beta_{jNL}X_{jNL}$$

where W is earnings and X is a vector including all observable human capital factors and the subscripts NL signify nonregulated occupations and L signifies a regulated occupation. Using the standard algebra of the decomposition analysis the equation becomes

$$\bar{W}_L - \bar{W}_{NL} = [\beta_{jL}(\bar{X}_{jL} - \bar{X}_{jNL})] + [(\alpha_L - \alpha_{NL}) + \Sigma(\beta_{jL} - \beta_{jNL})\bar{X}_{jNL}].$$

where the bar values are the mean values of the estimated values in equations one and two. Filer, Hamermesh and Rees (1996, pp. 548–50) offer a textbook treatment of the decomposition analysis.

The wage difference is broken down into two parts. The first part is attributed to human capital factors; essentially, this part of the calculation asks how much of the difference in wages across licensed and unlicensed occupations can be explained by differences in the average level of human capital across the two sorts of occupations. The part that cannot be explained in this way is taken to be the consequence of regulation. In column four I present the difference in licensing using the residual wage gap analysis model.

The results in column three suggest that earnings are higher for the licensed occupations that require more education and training relative to their comparison jobs. For cosmetologists and barbers, which are low wage and low education occupations, the impact of regulation appears to be small, which is consistent with earlier studies (Thornton and Weintraub, 1979). For dentists, on the other hand, the impacts for hourly wages are more than 30 percent higher. These estimates are similar to ones found for the effects of licensing in regulated versus unregulated occupations in Canada, which averaged around 27 percent (Muzando and Pazdaerka, 1980). For lawyers, the other occupation in the table that requires a baccalaureate degree, the effects of licensing are positive, but around 10 percent, which is considerably lower than the value found for dentistry.

Unlike unionization, where lower wage employees appear to gain as a consequence of organizing, licensing effects appear to be larger for higher wage workers, at least within this limited set of occupations. Consequently, licensing may increase wage inequality by first keeping out persons from entering higher wage occupations, and then by raising wages for persons in these already high income occupations. Moreover, more highly educated and influential occupations may be more powerful in state or local jurisdictions and be able to control supply more effectively. Since occupational licensing appears to increase earnings, on average, for persons in high income occupations relative to persons in lower income ones, this state and local policy may serve to exacerbate income dispersion in the United States.

The empirical results in column four do rest on several assumptions. First, they rely on a relatively small sample of licensed and unlicensed occupations. Although the examples are chosen to be representative, and the use of other licensed and unlicensed industries does not change the picture notably, the effect of licensing clearly varies a large amount across occupations. Second, the assumption that this residual difference is attributable to licensing requires that there not be too much spillover from the licensed to the nonlicensed occupations, which is likely the case for the occupations presented. Finally, there is always a danger in regressions using human capital characteristics that individuals who have greater unobservable ability characteristics may choose to enter a licensed occupation where the economic returns are greater, rather than occupations that require similar aptitude, but are unregulated. Given the large queue of persons wishing to enter these regulated occupations, part of the returns to licensed occupations may be the higher quality labor market abilities of persons in regulated occupations, which consumers in turn

see as raising the quality of service in these areas. Future analysis needs to be focused on disentangling these issues on regulation in the labor market.

Column five of Table 2 shows the change in employment for the licensed and nonlicensed occupations between 1980 and 1990. Dentistry, which is heavily regulated by licensing boards at the state level, had lower growth rates than its comparison nonlicensed professions. Other licensed occupations, such as lawyers, had faster employment growth than the nonregulated ones with which they were compared in the table. However, these basic employment change results do not control for changes in the demand for the service or how licensing may have changed it. Overall, the licensed occupations appear to have had somewhat faster growth rates than ones with similar educational requirements, although there are wide variations in growth rates in this sample.

Quality and Demand-Side Effects of Occupational Regulation

Most of the empirical work on the regulation of occupations has emphasized the barriers to entry, while relatively little empirical work has looked at issues involving the quality of output or the demand-side response to these quality effects.

In thinking about how occupational licensure can affect quality, it is useful to think through the situation one step at a time.[4] Licensing sets initial requirements for entering an occupation. These include residency requirements, letters from current practitioners regarding good moral character, citizenship, general education and specific training levels, and scores on specific tests. States and local governments can also change pass rates to mirror relative supply and demand conditions for the service. For example, when there is perceived to be an oversupply in the occupation, the regulatory board can raise the test scores required to pass the exam (Maurizi, 1974; Kleiner, 1990).

The consequence of these regulatory practices is a reduction in the flow of new persons into the occupation, which can have several effects on quality. The average quality of service provided increases as less competent providers of the service are prevented from entering the occupation, which should tend to raise quality. Moreover, persons in regulated jobs may think that they can capture any additional occupation-specific returns to their training, and this may increase the overall competency of the persons in the occupation. However, prices and wages will rise as a result of restricting the number of practitioners, which should tend to reduce quality received by consumers.[5]

[4] The explanation in the next few paragraphs draws on Kleiner and Kudrle (2000).

[5] As with any production relationship, other factors such as capital or technology may also contribute to the overall quality of service outputs. But since there is no particular reason to believe that these other factors have a larger effect on the quality of licensed services vs. unlicensed services, or vice versa, they are not discussed here.

Because of these countervailing forces of price and restricting supply of lower skilled applicants, the level of service quality as a consequence of regulation is uncertain. It is impossible on theoretical grounds to determine whether more intense regulation will increase or decrease the quality of the service provided.

The ambiguity of the effect of occupational licensing on quality carries over into ambiguity about the effect of licensing on the quantity of the service demanded. Clearly, the higher price should discourage consumption of the service. However, if there is higher (or less variable) quality, this may lead to an increased demand for the service.

Collecting empirical evidence on these issues of quality and demand is difficult. Typically, direct estimates of the quality of a service—say, the quality of a dental visit—are not available. For some licensed occupations, like cosmetologists and barbers in Table 2, it is not even altogether clear how one would measure quality, although there have been some attempts to do so. Perhaps measures of outputs can be developed through metrics like surveys of customer satisfaction, complaints to state licensing boards, or through rates of liability insurance?

An alternative approach is to compare results across states, looking at those which have tighter or looser occupational licensing, or no licensing at all. In a study of dental licensing, Kleiner and Kudrle (2000) examined the records of 464 new Air Force recruits from different states for which there were individual records over their lifetime, and found little statistical support for the role of tougher licensing measured either through characteristics of state licensing statutes or pass rates on dental health (Kleiner and Kudrle, 2000). Further investigation on the role of licensing on malpractice insurance rates, or complaints to state licensing boards also found few effects of tougher regulations. However, Kleiner and Kudrle did find a positive impact of licensing on the prices of certain dental services as well as on the hourly earnings of dentists. Although this study was not the first to attempt to obtain "productivity effects of licensing" (for an earlier example, see Carroll and Gaston, 1981), it did examine outcomes and the characteristics of the person served in a more comprehensive way using actual outcomes with lifetime data on individuals receiving the service.

An Agenda for Future Research

Occupational licensing is becoming an increasingly dominant factor in the regulation of services in the United States. The numbers of occupations that require licenses is growing. The number of workers who require licenses to work in their present occupation is increasing. In general, the requirements for entry into occupations with licensing are increasing, and geographic mobility declines for individuals who have an occupational license in only one or a limited number of jurisdictions. However, the amount of analysis of state and local regulation of occupations seems to be declining.

In part, the lack of recent analysis of occupational licensing may be because the topic lies at the intersection of labor economics, law, and industrial organization, and thus does not fit easily within the subfields of the economics profession as they have evolved. Moreover, occupational licensing is often thought to be a state or local issue, rather than a national one, and it probably attracts less attention for that reason as well.

But perhaps the largest barrier standing in the way of analysis of occupational licensing is that there is no well-organized national data set waiting to be exploited. No national or state data exists to assess the wage or consumer price effects of occupational licensing. Although the Bureau of Labor Statistics surveys workers on their union status, and also asks whether they are displaced through the Current Population Survey, no information is collected about whether individuals are certified or licensed as a condition of employment. Although the occupational associations, such as the American Bar Association and the American Dental Association, collect wage and salary data, and the number of new entrants and pass rates by state through the early 1980s, the state pass rate information is no longer tabulated or released to the public. Moreover, state licensing boards often are reluctant to provide this information to researchers. Consequently, estimates about the potential costs and benefits of licensing are difficult to obtain.

Economists interested in the area of occupational licensing will need to find ways to pull together their own data and approaches.

One approach, for example, might explore why states or countries have different occupational licensing requirements. Why does Massachusetts currently license almost three times as many occupations as Rhode Island (Wheelan, 1999)? Is occupational licensing endogenous to the industrial, occupational, demographic or political composition of a state? Recent empirical work in political economy suggests that political influence and funding of licensing initiatives by the professions are the most important factors influencing whether an occupation becomes regulated by the states (Graddy, 1991; Wheelan, 1999).

This question of what determines the existence and extent of occupational licensing is a question that might be tackled in an international context as well. Some occupations that are universally licensed in the United States, like cosmetologists, have varying levels or licensing or certification in many other advanced economies. For example, there is limited national licensing of hairdressers in many European Union (EU) nations. Generally, within western Europe, the EU requires that persons licensed in one nation must be granted a "right of establishment" to work in all other nations (Cairns, 1997), with some conditions. For example, dentists and other "science-based" occupations can practice their professions immediately. However, accountants and lawyers must work in their new country for up to three years with a licensed practitioner or take the host country's licensing exam (Seche, 1988). Occupational licensing is one area where there are fewer regulations affecting the labor market in Europe than in the United States. Moreover, given the language and cultural barriers in EU nations, it is doubtful if much international

mobility will take place within traditionally licensed occupations in the near future in spite of more relaxed licensing barriers (Krueger, 2000). Nonetheless, there has been little theoretical or empirical work on the economic causes or consequences of occupational licensing in the European Union (Faure, Finsinger, Siegers and Van den Bergh, 1993).

A second approach to occupational licensing would use fieldwork to find ways to quantify differences in the quality of certain services across states, and compare the quality with the degree of occupational licensing.[6]

A third approach might seek to find ways to examine the actual skill levels of certain occupations across states. Although regulated occupations routinely require license-holders to attend continuing education seminars, examinations on the contents are rarely given to the persons that attend, and denial of permission to work in the occupations once an individual passes the initial licensing exam is highly unusual. To my knowledge, there have been no empirical studies to document whether there are greater occupation-specific investments in licensed occupations relative to nonregulated ones.

A fourth approach might attempt to address the question of whether states with stricter occupational licensing have fewer injuries or illnesses or accidents related in that area. Again, to my knowledge this question has not been addressed empirically. Potential sources of information on damage caused by incompetent practitioners at the state level may come from data on malpractice insurance rates, although these will reflect both the extent of negligence and the propensity for litigiousness in a state. Major complaints to governmental licensing boards about regulated practitioners also may signal the presence of incompetent persons in the occupation. In general, the effect of occupational licensing on reducing major complaints or insurance rates have not been carefully documented.

Finally, in thinking about the policy implications of empirical research in this area, it is important always to keep in mind the policy option of certification. This potential substitute for licensing allows consumers or employers to choose whether they are willing to pay a higher wage for someone with greater state-documented skills relative to someone with fewer job characteristics. It is plausible to believe that certification would have lesser effects on the prices charged or the wages of an occupation, because it would not restrict supply as tightly, and also that it would have lesser effects on quality. Thus, it offers an intermediate choice between the extremes of no state role in qualifications at all and the absolute requirement of having a license before working at certain occupations.

[6] The effects of restrictions on occupations are potentially large. In one study, only tangentially related to occupational licensing, Bond, Kwoka, Phelan and Whitten (1980) compared the prices of the same set of eyeglasses in cities that had restrictions on advertising for licensed optometrists and ones without advertising restrictions (with appropriate covariate controls). The estimates from the field study found that glasses were 33 percent less expensive in the nonregulated cities. The authors conclude that regulation does have major effects on the price and quantity of regulated services, with no difference on their impacts on the quality of either the eyeglasses or the service rendered to the patient.

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DOES REGULATION AFFECT ECONOMIC OUTCOMES? THE CASE OF DENTISTRY*

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ABSTRACT

This study examines the role of variations in occupational licensing policies in improving the quality of services provided to consumers and the effect of restrictive regulations on the prices of certain services and on the earnings of practitioners. Theory suggests that more restrictive licensing may raise prices and at the same time raise demand by reducing uncertainty about the quality of the services. This article uses unique data on the dental health of incoming Air Force personnel to analyze empirically the effects of varying licensing stringency among the states. It finds that tougher licensing does not improve outcomes, but it does raise prices for consumers and the earnings of practitioners. These results cast doubt on the principal public interest argument in favor of more stringent state licensing practices.

I. INTRODUCTION

Do more restrictive occupational licensing statutes and administrative procedures enhance the quality of services received by consumers? Do more restrictive occupational licensing policies reduce the growth of practitioner supply? Do tougher occupational licensing provisions increase the prices of the services provided and raise the earnings of practitioners?

There are two major views on these questions. One perspective sees more restrictive licensing as an unnecessary barrier to occupational entry that mainly serves the interests of practitioners with little or no benefit to the

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public.[1] The main effects are assumed to be higher prices and, potentially, a negative effect on the quality of services received by consumers.[2] Another perspective focuses on the role that occupational licensing plays in reducing uncertainty in the minds of consumers about the quality of the product.[3] In this view, licensing is also seen as a way of encouraging the formation of human capital, the primary means to enhance the quality of services provided by the regulated practitioner.[4] Further, information asymmetry between sellers and consumers makes licensing a way of improving service quality. Additionally, according to this view, licensing improves outcomes by truncating the bottom of the quality distribution. Unfortunately, no rigorous empirical analysis has been able to address these competing effects for a major occupation in the United States. In this study we examine the effect of relatively more restrictive licensing statutes and administrative practices on the outcome of services rendered, the prices of those services, and the earnings of practitioners.

Occupational licensure has grown dramatically: in 1950 there were approximately 70 licensed occupations, but by the late 1970s there were over 500 covering about 18 percent of the U.S. workforce.[5] With the shift to a more service-oriented economy, the licensed sector is expected to grow more rapidly than the rest of the labor market.

Studies have compared the economic costs of state-by-state licensing to a system of nationwide endorsement, whereby practitioners licensed in one state are admitted to practice in all other states without additional restrictions.[6] A policy of nationwide endorsement represents a potential policy reform, since the proposal is often supported by a majority of the members of a profession relative to deregulation and could be adopted by national professional associations that would lobby regulatory boards.[7] Before such policies are recommended, however, the balance of economic costs and

[1] Lawrence Shephard, Licensing Restrictions and the Cost of Dental Care, 4 J. Law & Econ. 185 (1978).

[2] Milton Friedman & S. Kuznets, Income from Independent Professional Practice (1945).

[3] Kenneth J. Arrow, Essays in the Theory of Risk-Bearing (1971).

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[6] B. Peter Pashigian, Has Occupational Licensing Reduced Geographical Mobility and Raised Earnings, in Occupational Licensure and Regulations 299 (S. Rottenberg ed. 1980); and Morris M. Kleiner, R. Gay, & K. Greene, Barriers to Labor Migration: The Case of Occupational Licensing, 21 Indus. Rel. 383 (1982).

[7] Charles J. Wheelan, Politics or Public Interest? An Empirical Examination of Occupational Licensure (unpublished manuscript, Univ. Chicago, May 1999).

benefits of the current system of occupational licensure needs to be examined more thoroughly.

Our analysis of occupational regulation employs a new data set developed for this study that merges individual health and socioeconomic characteristics of Air Force recruits. We find little support for the position that tougher state regulations for dentists are associated with improved quality of outcomes. Further, more general state-level estimates show that tougher regulations do not appear to influence either complaints to dental licensing boards or malpractice premiums, but they are associated with slower growth in the number of dentists in the state, higher prices for the services examined, and higher hourly earnings for dentists. These estimates are consistent with theoretical models of occupational regulation that imply higher costs to consumers with few benefits.

In this study, we analyze the effect of tougher occupational licensing standards on measured dental outcomes and on the prices of services. Initially, we review the empirical literature on occupational licensing, which mainly focuses on the costs to consumers resulting from restrictions to entry and to interstate mobility. Next, we present a model linking regulation to the flow of new dentists as well as to quality and prices. In the section that follows, we develop the concepts and the unique data on Air Force recruit dental exams and socioeconomic characteristics used to estimate that model. We then specify alternative multivariate statistical models of the effect of more restrictive licensing provisions: first, on the quality of dental outputs, and then on the prices of certain dental services as well as earnings. The conclusions summarize our key results and present tentative policy implications.

A. Previous Empirical Results

It has been suggested that too much research effort has been directed at the effects of barriers to entry into licensed occupations and too little on issues such as demand and the potential output effects.[8] Unfortunately, studies examining the potential benefits have been hampered by the difficulty of obtaining covariates or by other data limitations. Therefore, very few have investigated the benefits that different forms of licensing may have on the quality of services.

Table 1 shows that, until Arlene Holen's work in 1978, major economic studies of the regulation of dentistry ignored quality issues.[9] Previous stud-

[8] Lee Benham, The Demand for Occupational Licensure, in Rottenberg ed., *supra* note 6, at 13.

[9] Arlene Holen, The Economics of Dental Licensing (final report submitted to the U.S. Department of Health and Human Services 1978).

TABLE 1

SUMMARY REVIEW OF STUDIES ON THE ECONOMIC COSTS AND BENEFITS OF STATE OCCUPATIONAL REGULATION IN DENTISTRY

Study	Data and Technique	Measures of Costs and Benefits	Conclusions
Alex Maurizi, Occupational Licensing and the Public Interest, 82 J. Pol. Econ. 399 (1974)	Two pooled state cross sections (1940, 1950) of pass rates were regressed on estimates of excess demand and practitioner income	Decreased pass rates in response to excess demand are assumed to be against the public interest	Pass rate for dentists is found to correlate negatively and significantly with excess demand, but practitioner income is more significantly positive in the first year than negatively significant in the later year
Lawrence Shepard, Licensing Restrictions and the Cost of Dental Care, 4 J. Law & Econ. 185 (1978)	Five-equation model estimated with two-stage least squares employs state-level data for 1970 relating the price of dental services to reciprocity	Price increases resulting from lack of reciprocity measure cost	Lack of reciprocity raises average service prices by $1.87, resulting in a national cost estimated at $700 million in the mid-1970s
Arlene Holen, The Economics of Dental Licensing (1978)	Several measures of dental health, including the examination records of 477 naval recruits from 41 states in 1969, are explored with a series of OLS models employing the state dental exam fail rate as a measure of restrictiveness	Variation in decayed teeth as a fraction of the sum of the decayed, missing, and filled teeth measures quality benefits	A weakly significant negative coefficient on the pass rate suggests that more stringent dental licensing is associated with less dental neglect

Sidney L. Carroll & R. J. Gaston, Occupational Restrictions and the Quality of Service Received, 47 S. Econ. J. 959 (1981)	Several proxies for dental quality including self-described practice busyness and waiting times as well as the some of the same dental health data used by the Holen study, *supra,* are used in equations that first relate practitioner density to restrictiveness measured by a citizenship requirement or reciprocity and then density to the quality measure, employing state-level cross-section data. The less direct quality measures look at all 50 states for 1970; the dental health measure uses 29 states with 1969 data	Short waiting periods and a better oral hygiene index would indicate a possibly positive impact of restrictiveness	The length of work week and delays in seeing patients are positively and significantly related to practitoner density, which in turn is negatively related to restrictiveness as measured by citizenship; oral hygiene is negatively related to density, which, in turn, is negatively related to reciprocity
Brian Boulier, An Empirical Examination of Licensure and Licensure Reform on the Geographic Distribution of Dentists, in Occupational Licensure and Regulations (S. Rottenberg ed. 1980)	Two-stage least-squares estimates of constant elasticity supply and demand functions for dental services are developed using 1967 state-level data	Net benefit measured by changes in consumer surplus and producer welfare resulting from the interstate reallocation of (a fixed total supply of) dentists is estimated to be necessary to equalize service prices among states	Reciprocity, which is assumed necessary and sufficient to establish uniform prices among states, would create an increase in consumer surplus of $52 million in 1978 dollars and would increase producer welfare as well

ies implicitly held quality constant while concentrating attention on estimates of excessive prices or incomes resulting from greater restriction. In part of her work, Holen employed 1968 data on the dental condition of 477 naval recruits,[10] and, on the basis of one measure of quality (employing the number of decayed, missing, and filled teeth) and the use of the state's licensing pass rate to measure restrictiveness, she finds a positive effect of restrictiveness on quality.

A comparison of Holen's work with part of the analysis of dentistry presented by Sidney Carroll and R. J. Gaston[11] illustrates the difficulty of developing an adequate model of the costs and benefits of restrictiveness. Employing other data from the same clinical study that Holen used, Carroll and Gaston use an oral hygiene index (relating to the soft tissue surrounding the teeth rather than a measure of the condition of the teeth) as the dependent variable and the presence or absence of licensing reciprocity between states as the measure of restrictiveness. They find a result essentially the opposite of Holen's: no increase in the quality of outcomes.

While both the Holen and the Carroll and Gaston studies are creative and valuable, neither directly measures either dental health or restrictiveness satisfactorily. Holen indexes dental health by using a variant of a conventional but approximate measure of the condition of the teeth, while Carroll and Gaston's oral hygiene index is much less appropriate as an outcome measure because it estimates a condition that correlates very imperfectly with overall dental health.

Although some measure of a state's pass rate might arguably be superior to the reciprocity measure used by Carroll and Gaston as a single index of restrictiveness, Holen employs only the raw contemporary pass rate of the recruit's state of residence, which, among other problems, implicitly assumes that the same percentage pass rate implies the same absolute level of competence across states. Neither study acknowledges the complexity of modeling restrictiveness. For example, even if state restrictiveness at a given time could be appropriately measured, there could be a serious mismatch between contemporary state restrictiveness and the restrictiveness applying to various cohorts of dentists practicing in that state. Moreover, neither study acknowledges that, given the propensity for geographic mobility in the United States, a substantial amount of the recruits' dental care may have been received far from the place listed as home.

In addition to important limitations in measuring dental health and re-

[10] R. J. Stepnick, H. J. Keene, & R. Bognore, Dental Caries, Periodontal Disease, and Oral Hygiene Interrelationships in Naval Recruits (Naval Dental Res. Inst. 1975).

[11] Sidney Carroll & R. J. Gaston, Occupational Restrictions and the Quality of Service Received: Some Evidence, 47 S. Econ. J. 959 (1981).

strictiveness, neither study allows for many other key variables and the relationships that could be conditioning the interaction among them. Among other problems, these studies do not consider gender, race, socioeconomic status, or insurance coverage.

Our investigation aims to advance the analysis on all three fronts. We employ a more comprehensive measure of dental health. We develop alternative measures of restrictiveness, including both a "quality-adjusted" pass rate and statutory factors, and we attempt to specify our relationships by employing as many plausible controls for economic and demographic factors as possible. This is accomplished using data especially gathered for these purposes.

B. Analyzing Licensure Effects on Demand on Outputs

The theoretical effect of entry reduction on the price of services is well developed; the linkage between quality and demand is also important but receives much less attention in the literature.[12] Current theory and evidence provide inconclusive results about the effects of occupational licensing on the improvement of service sector outputs. To arrive at conclusions concerning overall economic welfare, one must understand the manner in which the institutional imposition of licensure affects supply and demand in specific markets. This analysis aims at discovering the channels through which individuals' dental outcomes are affected by licensing restrictions on the occupation providing the service inputs. We can then develop a measurable model to estimate whether benefits or losses accrue to the consumer from licensing statutes and administrative procedures. Figure 1 shows the expected process of the effect of occupational regulation on dental health status. Along its upper branch, the figure shows how dental regulation operates through state-level pass rates, more restrictive licensing statutes, and reciprocity agreements with other states to restrict the licensing of new dentists. The empirical results for this relationship show that licensing boards increase or reduce new dentists in response to current changes in the market, operating much like a traditional "cobweb" cycle.[13] The consequence of restricting entry in any period is to reduce supply and increase the prices of dental services.

The same regulatory factors noted above are shown to influence the quality of dental care. Assuming that lower quality dentists are removed as en-

[12] Dennis W. Carlton & Jeffrey M. Perloff, Modern Industrial Organization (2d ed. 1994).

[13] Alex Maurizi, Occupational Licensing and the Public Interest, 82 J. Pol. Interest 399 (1974); Kleiner, *supra* note 5; and Morris M. Kleiner and Robert T. Kudrle, Do Tougher Licensing Provisions Limit Occupational Entry: The Case of Dentistry (Working Paper No. 3984, Nat'l Bureau Econ. Res. 1992).

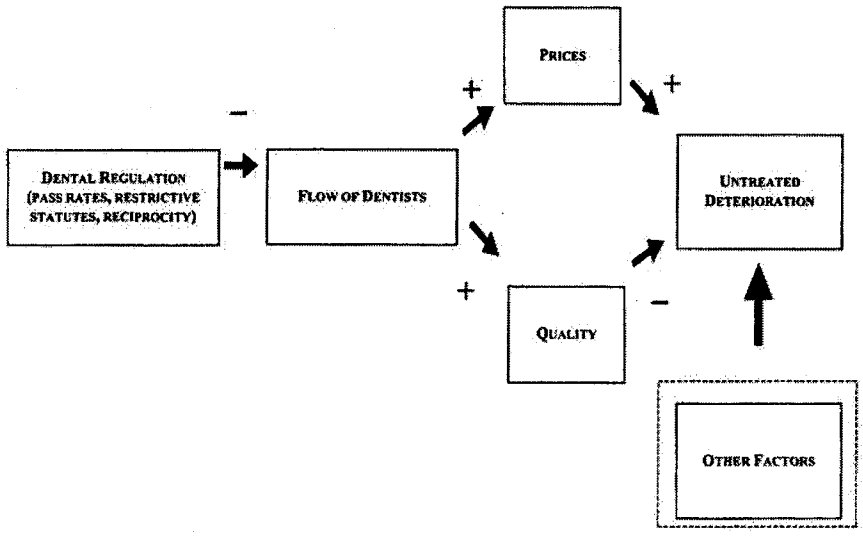

FIGURE 1.—Regulation's impact on untreated dental deterioration

try restrictions are increased, as shown on the bottom portion of Figure 1, the mean quality of a dental visit (which we define as a representative set of services) is increased since the remaining dentists entering the occupation are of higher quality.[14] With this presumed enhancement in quality, the use of services would increase as perceived quality grew.[15] In the absence of any theory or evidence to the contrary, we assumed that the stringency of professionally administered quality controls such as licensure is the best proxy for quality as recognized by the consumer. This factor alone would directly reduce untreated deterioration as shown in Figure 1. However, higher dental prices alone would increase the overall extent of dental deterioration. The net effect of regulation on dental deterioration is therefore theoretically unclear. The overall effect of greater regulation on the quality of services delivered and on dental health needs to be decided with data and analysis.

The basic relationships derived from Figure 1 would suggest that the quality of a dental visit would be negatively related to the pass rate, PR, in a state, assuming time and effort spent with each patient remain the same.

[14] Unfortunately, the quality of a dental visit is an unobservable in our data set with the standard assumptions about the error term of this factor. We assume that the quality of the visit increases with the quality of the practitioner.

[15] Hayne E. Leland, Minimum Quality Standards in Markets with Asymmetric Information, in Rottenberg ed., *supra* note 6, at 265.

Either lower quality candidates would be rejected by a state or those individuals would incur additional occupation-specific training in order to pass the exam. This relationship is presented in equation (1):

$$VQ = f(PR, X_1), \tag{1}$$

where visit quality (VQ) is negatively related to the pass rate for dentists and X_1 is a set of other covariates.

In contrast, an increase in the pass rate would enhance the access to dental services. This would provide greater access as more dentists are available in the state, which would reduce the money price of a visit and the office waiting time to see a dentist as well as travel time. This would be included in the implicit or full price for a dental visit. This relationship is shown in equation (2):

$$FP = f(PR, X_2), \tag{2}$$

where FP is the full price, which includes time costs; FP is influenced negatively by the pass rate,[16] and X_2 is a set of control variables.

Overall dental outputs would be a function of the quality of a dental visit—which is an unobservable in our model—and the access to dental care. Although others within a dental establishment can provide dental services, all services are under the control, monitoring, and direction of a dentist. For example, in all states dental hygienists must work, by statute, with the guidance of a dentist. Even though we examine only the regulatory requirements for becoming a dentist, we note that restrictiveness measures for dentists and hygienists are highly correlated across states. The Council of State Governments measures of these legal and administrative requirements show a simple correlation of about .90. Therefore, in equation (3) overall dental health is a function of both the full price and dental care quality:

$$DH = f(FP, VQ, X_3), \tag{3}$$

where DH is the dental health of a person in a certain jurisdiction and X_3 is a vector of other covariates. In sum, dental demand depends on three factors: perceived quality, money price, and time price of representative services and other covariates.

Many studies of service demand have attempted to overcome the problem of variability in service output by making quality adjustments based on characteristics of inputs. However, there is no assurance that the services actually received by consumers are positively correlated with these proxy

[16] Further, more dentists might be more effective lobbying for dental coverage in medical health plans in both the public and private sectors, thus reducing point-of-service money prices.

measures of input productivity, and the distinction between the number of inputs employed and the quality of output received are quite important. An inferior dentist may require multiple attempts to fill a tooth to the same standard of quality that another dentist can accomplish at once.[17] Instead of measuring the number of separate visits or fillings, suppose we examine the dental condition a number of years after the intervention. From this perspective, an individual treated by the inferior dentist and one by the more skilled dentist may be observed to have one filled tooth. Therefore, we can infer that the output of services made possible by the original investments has been identical, regardless of input activities.[18]

Appropriate research measures of quality can be developed by considering the stock of dental health status, HS. The depreciation rate, DR, which lies between zero and one, is inversely related to the extent of personal and professional preventive investment made by the individual over t periods, as well as the stock of untreated previous deterioration. We assume that a significant component of preventive care is service performed by professional agents. Another component is clearly related to the consumer's personal dental care.

As dental health status depreciates, corrections can be performed to repair damage. Thus, the stock can be, in a sense, replaced at some rate, CR. Then in equation (4),

$$HS_t = (1 - DR_t + CR_t)HS_{t-1}. \tag{4}$$

At a given time a person's dental health can be represented by equation (5):

$$TD_t = \sum_{i=0}^{t} (1 - DR_t + CR_t)HS_0. \tag{5}$$

Thus we can define untreated deterioration[19] as[20]

$$UD_t = HS_0 - HS_t. \tag{6}$$

[17] W. Oi, The Economics of Public Safety, 4 Bell J. Econ. 3 (1973).

[18] To have comparable service flows or rates, the individuals must be the same age and otherwise similar or adjustment for such differences must be made.

[19] The term CR is net intervention, and, because corrective interventions often need replacement or repair, the ratio of gross to net corrective intervention will typically grow over time.

[20] This formulation does not embrace some orthodontic and other procedures other than repair that might in rare cases make possible an improvement in the initial functioning dental condition after a complete set of permanent teeth have developed. By focusing on dental health, we also ignore issues of cosmetic dentistry.

The deterioration of dental health status will vary considerably across individuals because of genetic factors that we cannot control for, as well as for some uncontrolled environmental reasons (that is, diet or general health status).[21]

Let all else be held constant, and $(1 - DR_t)$ will be a strictly increasing function of the quality and quantity of prevention in equation (7):

$$(1 - DR_t) = f(P_{1t}, P_{2t}, P_{3t}), \tag{7}$$

where P_1 = an index of personal preventive intervention; P_2 = an index of public prevention, the fluoridation of public water supplies; and P_3 = an index of professional intervention, mainly cleaning and sealants.

In developing an empirical construct, a measure of only one aspect of the three relevant variables, the fluoridation of the water supply in the areas where an individual has lived, is available to us. The other two variables are unobservables in our model that we attempt to capture through the employment of proxies known to contribute to personal preventive behavior and a proclivity to use preventive services. The dental care literature suggests that both unobserved prevention investments are positively correlated with family income and the household head's education level.[22] Overall, we assume that controlling for various attributes satisfies the usual assumptions about the error term.

Licensing restrictiveness has two major effects on practitioners. First, individuals considering entering an occupation in a state may decide not to when the pass rate is low.[23] Statutory provisions, such as a waiting period or a requirement to retake of a state portion of a licensing exam if an individual has qualified in another state, may further reduce new entrants. Such restrictions may increase the average quality of the in-state dentists. Second, for most dentists choosing a state in which to locate, initial failure would result in more study and retaking the exam, thus presumably enhancing occupation-specific human capital. In both of these cases the average quality of dentists in the state would rise, but prices may also rise because the supply of dentists and access to dental services would be reduced.

[21] Robert T. Kudrle & Lawrence Meskin, Introduction to Reducing the Cost of Dental Care (R. T. Kudrle & L. Meskin eds. 1983).

[22] *Id.*

[23] We estimated that the present-value cost to dentists who fail the exam was approximately $54,000 in 1997 dollars. This estimate was derived by initially assuming that the individual becomes a licensed practitioner by passing the exam the next time it is given, which is every 6–12 months, and the individual is employed as a dental assistant in the interim. Following Solomon W. Polachek, Occupational Self-Selection: A Human Capital Approach to Sex Differences in Occupational Structure, 63 Rev. Econ. & Stat. 60 (1981), the estimate assumes the average lag and includes lost earnings growth of 1 percent for the next 5 years due to lost experience and nominal earnings growth differences.

In addition to its obvious significance for CR in equations (4) and (5) licensing is assumed to have a major effect on P_3 in equation (7) because preventive services must be delivered under a dentist's supervision in all states, and we assume that views about the quality of dentistry rather than those that might be formed about ancillary services drive consumer behavior.

C. *Concepts and Data*

Two major difficulties have plagued attempts to model consumer benefits in previous studies of occupational regulation. First, researchers lacked data detailing statutes and pass rates as measures of state restrictiveness. Second, they lacked comparative data on the results of services provided. Our data sets focus on both of these issues as well as on essential controls, acknowledged by previous researchers.

We collected detailed dental legal information from each state's statutes for the period from 1960 to 1994, updating it with similar data gathered by the Council of State Governments.[24] We also obtained pass rate data from the American Dental Association; prior research has shown that the pass rate is the key measure of restrictiveness.[25]

Previous studies have employed pass rates with incomplete attention to the possible variation in their meaning across states. For example, a high pass rate in California could be controlling dental practice at a higher level of quality than a low pass rate in North Dakota if the average quality of the applicant is sufficiently higher in California. We have attempted to deal with this problem by including a common quality factor in our estimating equations. All incoming dental students have taken national entrance examinations, and we include the mean incoming score on that examination for the most appropriate dental school for each state. In general, one dental school dominates the production of dentists for a given state.[26] This variable is used to control for the premarket educational abilities of the stock of dentists.[27]

Developing the most appropriate new measures of the dependent and

[24] Council of State Governments, Occupational Licensing (1987, 1994). This source also cataloged new information on the licensure of dental hygienists and dental assistants.

[25] Maurizi, *supra* note 13; M. Getz, J. Siegfried, & Terry Calvani, Competition at the Bar: The Correlation between the Bar Examination Pass Rate and Profitability of Practice, 67 Va. L. Rev. 863 (1981); Kleiner, Gay, & Greene, *supra* note 6; Kleiner & Kudrle, *supra* note 13.

[26] For those states that have more than one dental school, the scores were weighted by the relative size of the cohorts.

[27] Derrick Neal & W. R. Johnson, The Role of Pre-market Factors in Black-White Wage Differences, 104 J. Pol. Econ. 869 (1996).

some independent variables involved several steps. As stated, we assembled measures for each significant dimension of restrictiveness. Time-series data are important for many measures because the stock of practitioners at any time is composed of a large number of separate "vintages" with varying qualifications. For the period that most of our sample was growing up, however, from the beginning of 1960 to the end of the period in 1987, there was a rank-order correlation of .60 for the states maintaining their either high or low level of restrictiveness as measured by pass rates and statutory measures through a summated rating scale.[28]

We were unable to find any agency in the United States that routinely collects data on varying dental conditions along with appropriate controls. Therefore, we employed a unique source of medical and demographic information from a sample of new enlistees into the U.S. Air Force. We gained the cooperation of the commander of Lowry Air Force Base near Denver, Colorado, historically a major base for new recruits. We designed and provided a questionnaire that Air Force personnel administered as part of the initial dental examination required of everyone. Although persons were not obliged to cooperate, no one declined to fill out the questionnaire. Some forms were not fully completed, but only about 5 percent of them were unusable for that reason. Some self-reporting errors arise because of the retrospective nature of the questions, but the recruits were told that the results were to be used anonymously. We were able to obtain access for only a limited period in early 1992 because the base was closing.

Data were gathered on the age, gender, and race of the recruit, on the education of the head of the household, and the total income of the household in which the recruit grew up. Parents' education and income (corrected by number of members) were especially important because they were known from previous research to affect the demand for dental services.[29] Fluoride reduces the incidence of cavities, the single most important dental

[28] Both David Bartholomew, The Statistical Approach to Social Measurement (1996), and Andrew Wang, Economic Reform and State Enterprise Productivity in China: An Application of Robust Estimation and Latent Variable Measurement Methods (Ph.D. dissertation, Harvard Univ., Dept. Econ. 1997), use summated rating scales based on unweighted values aggregated to form a single variable. After 1987 dental board scores were reported by region rather than state. Regional results checked with a shift-share allocation did not reveal a qualitative change in the pass rates to 1991. More recently, as reported in Lawrence Meskin, Time for a Dental Board Checkup, 125 J. Am. Dental Assoc. 1418 (1994), the American Association of Dental Schools adopted as a goal the elimination of all state and regional licensing examinations and their replacement with examinations in dental school or a national examination.

[29] Given the average age of 21, the head of household was self-reported for each enlistee to be his father, mother, or legal guardian. Also see Robert T. Kudrle, Dental Care, in National Health Insurance: Conflicting Goals and Policy Choices (J. Feder, J. Holohan, & T. R. Marmor eds. 1980); Kudrle & Meskin, *supra* note 21.

disease in young people. Because the public water supply can be a major source of fluoride, we obtained residence location and duration from birth until entry into the Air Force from all persons in the sample. Place of residence was also used to identify the restrictiveness of dental regulation at the state level.[30] Further, we asked new Air Force recruits if their family was covered by dental insurance and how many times they went to the dentist in the previous 2 years.

Indices of dental outcomes were developed that allowed for the assessment of previous and current dental deterioration (TD), the amount of repair already performed on an individual (TC), and the amount of repair needed to bring the individual to complete correction (UD). A smaller amount of untreated disease implies a higher dental health status. A licensed research dentist worked with us to develop the coding and examined the dental forms for each of the individuals. These persons had been examined by Air Force dentists who ensured that dental health status was appropriately specified. The information obtained from the dental examinations resulted in the coding of dental corrections (CR) and any form of untreated tooth-related deterioration (UD). Periodontal information is not explicitly used in the study.[31]

Table 2 presents the means and standard deviations for the individuals in our sample for licensing and state characteristics. Geographic spread is diverse, and the education (12.7 years) and family income ($27,621) of recruits closely matched the country as a whole (12.6 years and $29,458) for the early 1990s from Current Population Survey estimates. Our sample contains over 23 percent of nonwhite Americans, but only 17 percent of the individuals in our data set are women.

Other analysis has found that the socioeconomic backgrounds of military recruits, including Air Force recruits, closely match the background of average Americans.[32] In particular, this sample contains a sufficiently large sample of individuals from low-income households (approximately 22 percent below the U.S. designated poverty level) to allow us to examine the effect

[30] Since the children of military personnel enlist to greater degree than the general population, we checked this issue in our sample. We found that only 27 individuals may have spent all or part of their childhood in military households and therefore would have received care isolated from local dental markets.

[31] Many of the examinations lacked this information, and there is a paucity of precision in this measure due to the absence of periodontal probing or the use of any of the standard periodontal indices by the Air Force on routine dental examinations. Periodontal condition plays an important part in the dental health status of the general population, but it is less useful in a sample of very young adults since periodontal disease is not a major problem in this age group.

[32] David Boesel, The DOD Survey of Recruit Socioeconomic Backgrounds (U.S. Def. Manpower Data Center 1989).

TABLE 2

MEANS AND STANDARD DEVIATIONS

Variable	Mean	SD
Quality measures (N = 464):		
Total dental depreciation ($)	669	768
Dollar value of untreated correction ($)	227	328
Dollar value of previous treatment ($)	442	668
Price of filling ($)	44.84	7.17
Price of cleaning ($)	76.52	15.98
Individual characteristics (N = 464):		
% male	82.7	...
% nonwhite	24.8	...
Years of education	12.7	1.99
Age	21.60	2.46
Household age	2.62	1.78
Family income ($)	27,842	19,398
% with dental insurance coverage	57.9	49.5
Average dental visits (last 2 years)	2.63	2.55
State characteristics (N = 50):		
Fluoridation rate (%)	53.25	41.21
Average malpractice insurance fees ($)[a]	1,912	761
Average quality score of dentists in state dental school	4.68	.39
Weighted pass rate	85.8	6.98
Endorsement statute (%)[b]	58	...
Citizenship requirement (%)[c]	22	...
Public use sample data (1990 census; N = 3,361 dentists)		
Hourly income ($)	41.02	43.02
Annual income ($)	81,948	58,470
% married	83	...
% U.S. citizens	92	...
% nonminority	91	...
% female	13	...
Age	43	10
Hours worked weekly	41	10

[a] Fees are shown for a dentist with 10 years of experience.
[b] Applicants receive a license if they meet entry requirements in force at the time of initial licensure.
[c] The individual must be a citizen in order to be licensed in the state.

of varying licensing procedures on the quality of services received for individuals who may be most adversely affected by tougher regulation. Consequently, using the Air Force base sample should enhance the generalizability of our results to other similar cohorts.

We converted the UD value of untreated deterioration into a monetary measure as a method of evaluating the cost of bringing an individual to an optimal dental condition.[33] We used the national average fees for corrective

[33] A. G. Christen *et al.*, United States Air Force Survey of Dental Needs, 98 J. Am. Dental Assoc. 726 (1979).

treatment by general practitioners obtained from the 1992 survey from *Dental Economics* as the prices to bring each person in our sample up to the best possible level.[34] This survey also provides state-by-state average prices for most major dental procedures that we use for our state-level analysis.[35] The means of these values as well as those for most of the other variables are also presented in Table 2.

Each of our 464 individual observations contains information on household variables and state characteristics weighted by the time the person spent in each of the 50 states. Since there is no clear consensus from the dental establishment regarding which stage of dental development has the greatest effect on dental outcomes, our analysis assigns equal weight to each age period.[36] By comparison, this sample is similar in size to the 477 observations of naval enlistees from 41 states used by Holen and by Carroll and Gaston.[37]

We asked all enlistees where and how long they lived at each location, giving state characteristics proportional weights corresponding to the time spent in that state.[38] Measures of heavy, medium, and light regulatory licensing statutes and qualifying exams were developed by noting that the average pass rate for the United States was approximately 85 percent. Levels below 80 percent with either no reciprocity or no endorsement provision for out-of-state dentists were designated to be heavily regulated. Medium

[34] Dental Economics (unpublished manuscript, tables on prices of dental procedures by state 1993).

[35] We also estimated the more conventional summated rating scale of dental condition developed by dental researchers to examine the robustness of our results. As explained in H. Klein *et al.*, Studies on Dental Caries: Dental Status and Dental Needs of Elementary School Children, 53 Pub. Health Reporter 751 (1938), and J. W. Knutson *et al.*, Dental Needs of Grade-School Children in Hagerstown, Maryland, 27 J. Am. Dental Assoc. 579 (1940), the most widely used measure of overall dental health is the DMF (that is, the value of decayed, missing, and filled teeth). The DMF is considered to have a range of 0–128 and is a summated rating scale for our purposes. The mean DMF for our sample was 13.5, with a range of 0–35. While the mean corresponds to a rather low overall number of cavities, the range suggests a varied experience. The mean dollar amount of total previous correction is $442 (SD = 668), while the average dollar amount to bring individuals to a disease-free state is $227 (SD = 328). All 50 states were represented in this analysis. Our results were similar using both physical and value metrics.

[36] According to the Bureau of the Census Vital Health Statistics of the United States, Dental Statistics 10 (1988), only one-third of persons under age 4 use dental services. We, therefore, estimated our model assuming no dental care for persons of this age. Additional analysis showed that this assumption had no qualitative effect on our basic results.

[37] Holen, *supra* note 9; Carroll & Gaston, *supra* note 11.

[38] In order to estimate models that are consistent with those presented in the analysis in Holen, *supra* note 9, we also estimate the models allocating each individual to a state, based on the last state the person lived in prior to enlistment in the Air Force. The results are consistent with the ones shown in Table 4.

regulations were those states with pass rates between 80 percent and 90 percent and a provision for reciprocity or endorsement. Light regulation included those states with pass rates above 90 percent and either a provision for reciprocity or endorsement.[39]

One of the major advantages of having a data set like the one we have gathered is the ability to reduce unobserved heterogeneity. Since the group that formed the basis of our measures of dental care quality has similar ages and interests, and somewhat similar abilities, the unobservable variation relative to a randomly selected grouping of ages, interests, and abilities should be greatly reduced. An analysis of the general population would likely suffer from a wider variation in such characteristics, as well as including persons with failing general health, which would be more difficult to control for using standard statistical approaches. Without such heterogeneity our analysis of differences in untreated dental outcomes should more likely be explained by economic, environmental, and policy variables about which we have data rather than large differences in attributes that we cannot measure or observe. Of course, the use of such a select group for our analysis reduces our ability to generalize to the U.S. population. To partially correct for this potential shortcoming and to compare with the results from our selected sample, we use other state and national data to examine quality and price effects of varying restrictiveness.

D. Estimating a Model of Dental Health Based on Individual Demand

In order to begin an evaluation of states in term of costs and benefits, we first rated each state using the average value of our index of dental health for the sample of Air Force recruits for that state. The highest and lowest five states in each category are presented in Table 3, and the dental restrictiveness index of the state was rated high, medium, or low. In panel A we rank the states with the best average dental condition. The states with a middle category of tough licensing, like Wisconsin and Rhode Island, have the highest quality rankings using this scale. In panel B we rank the five states that have the worst dental condition. We find that Idaho and Alaska have the highest value of untreated deterioration. Hawaii is among the more restrictive states, yet has high levels of deterioration. This ordering does not show a clear relationship of regulation to dental outcomes. These results, of course, do not take into account other covariates that may influence un-

[39] Those states that had lower pass rates but had reciprocity or endorsement were moved to the medium level of restrictiveness. Five states changed restrictiveness categories using this convention.

TABLE 3

FIVE HIGHEST AND LOWEST RANKED STATES USING THE DENTAL QUALITY INDEX AND INFORMATION FROM AIR FORCE ENLISTEES

A. STATES WITH HIGHEST DENTAL QUALITY

Lowest Weighted Total Deterioration			Lowest Weighted Untreated Deterioration		
Rank	State	State Restrictiveness Index	Rank	State	State Restrictiveness Index
1	Rhode Island	Medium	1	Rhode Island	Medium
2	Wisconsin	Medium	1	Wisconsin	Medium
3	Utah	Medium	1	Vermont	Medium
4	Iowa	Medium	1	Nebraska	Medium
5	Missouri	Medium	5	Utah	Medium

B. STATES WITH LOWEST DENTAL QUALITY

Highest Weighted Total Deterioration			Highest Weighted Untreated Deterioration		
Rank	State	State Restrictiveness Index	Rank	State	State Restrictiveness Index
1	Hawaii	High	1	Idaho	Medium
2	Connecticut	Medium	1	Alaska	Low
3	Alaska	Low	1	Minnesota	Medium
4	Idaho	Medium	1	Kentucky	Low
5	Arizona	Medium	5	Wyoming	Medium

treated dental deterioration. We now turn to multivariate analysis that controls for these factors.

We specify the model below to be consistent with our demand model and with Figure 1, which outlines regulation's effect on consumer welfare. We specify the following model of individual dental health based on the demand for dental services:

$$TD_i = X_{i1}\beta + R_i\delta + \varepsilon_i; \tag{8}$$

$$TC_i = X_{i2}\gamma + R_i\eta + \varepsilon_i. \tag{9}$$

In equation (8), TD_i is the cumulative depreciation of the individual's dental condition drawn from clinical examination of Air Force recruits and aggregated by the estimated amount of past expenditure as well as the estimated expenditure needed to bring the teeth of each individual to fully repaired condition. In equation (9), TC is the total estimated value of corrective services actually obtained by individual I. The term X_{ij} is a vector of personal attributes of the Air Force recruits that include economic and demographic characteristics of the person. The terms R_i are the measures

of state regulation including licensing provisions as well as a control for the presence of flouridated public water supply in the area of residence weighted by the length of time the person was in the area.[40] The term R_i includes the prices of representative preventive and restorative procedures. The terms β, δ, γ, and η are unknown parameter vectors, and ε is an independently and identically distributed (i.i.d.) error term.

The independent variables in equation (8) include ones that we posit determine personal, public health, and professional contributions to prevention.[41] It should be stressed that the restrictiveness variable in this equation is for dentists only, as is the case in equation (9).

An estimate of (8) using a Tobit specification to account for individuals who had no dental problems, about 10 percent of our sample, shows, not surprisingly, that unobservable personal and genetic characteristics dominate overall dental disease. Our estimation of equation (9) finds total deterioration to be a significant determinant of total correction.[42] This equation suffers from simultaneity bias because of the inclusion of total deterioration. Since we were unable to develop a suitable instrument for total depreciation, we report OLS estimates in Appendix Table A1, and turn to reduced-form estimates.

Our study concerns the effect of varying regulation on dental health through both prices and services rendered; attention should therefore focus on reduced-form estimates. In addition, the OLS estimates are quite consistent with the reduced-form results.

Because there is likely to be a substitution between preventive and corrective care, the estimates of untreated deterioration divided by total deterioration in reduced form should provide additional insights into the relationship between more restrictive licensing practices and the measures of enhanced dental outcomes. In a reduced-form equation based on equations

[40] Fluoridation policies are frequently determined by substate jurisdictions. Since we had information on the city or county and duration of stay for all of the recruits, we constructed an index for each person in the sample. In other aggregate estimates where we needed state fluoridation averages, we constructed another index weighted by the share of a state's population exposed to public fluoridation.

[41] Only professional preventive services have money price as a (nontrivial) component. The principal public health measure, fluoridation, is a local public good, while flossing and brushing overwhelming involve a time price. All of the evidence suggest that, despite the higher shadow price of personal prevention for persons with higher incomes, preventive behavior increases with income. This result conforms with the hypothesis in Victor R. Fuchs, Time Preference and Health: An Exploratory Study in Economic Aspects of Health 93 (Victor R. Fuchs ed. 1982), that the rate of time preference is a powerful determinant of health-enhancing behavior.

[42] In addition, our estimation of equation (9) finds education and insurance coverage to be significant determinants of total correction. These results are shown in Appendix Table A1.

(8) and (9) we can estimate UD/TD (untreated dental depreciation divided by total depreciation) as follows:[43]

$$UD_i/TD_i = X_{i3}\lambda + R_i\eta + \varepsilon_i, \tag{10}$$

where we have the reduced-form impact multiplier coefficients. In this case the X_i is again a vector of characteristics of the Air Force recruits, R_i is the weighted state- and area-specific characteristics of the licensing variables, λ and η are unknown parameter vectors, and ε_i is the error term.[44]

In our sample 68 percent had some uncorrected dental deterioration and 90 percent had some measurable deterioration during their lifetime. Given the number of zero observations in our data set resulting from either zero deterioration or as a consequence of complete correction, the Tobit specification is an appropriate functional form.[45] In Table 4 we present Tobit estimates of the effect of licensing pass rates and statutes on the dollar value of untreated dental disease, and their marginal effects.[46] To maintain as large a sample as possible, when our questionnaire lacked information on a covariate, we substituted the means for missing values and added a dummy variable that took the value one when the mean was employed and zero otherwise.[47]

Columns 1–4 of Table 4 show results of estimates that include only measures of restrictiveness as well as household and individual demographic characteristics as determinants of untreated deterioration. In columns 5–8 we include a number of additional controls. Coefficient estimates and mar-

[43] In order to check for functional form of our specifications, we also estimated total untreated dental depreciation with total depreciation as an independent variable along with X_{ij} R_{ij} measures and found no qualitative changes in our basic results.

[44] We do not include the number of visits to the dentist during the last 2 years since it would be potentially endogenous with untreated dental outcomes. We also used the number of dental visits as an instrument and found no statistical effect. However, we did estimate the model with this variable to control for access to dental services and to be consistent with other specifications, such as those developed by Holen, *supra* note 9, in her initial examination of this issue, and found no qualitative differences from those presented in our Table 4.

[45] We also estimated the equations presented in Table 4 with 308 observations corresponding to all persons with nonzero correction and found results consistent with the estimates presented. In addition, we estimated our reduced-form Tobit with 416 observations corresponding to all persons who had nonzero deterioration during their lifetime and found no qualitative differences relative to those shown in Table 4.

[46] As Helena Chmura Kraemer & Sue Thiemann, How Many Subjects? Statistical Power Analysis (1987), demonstrates, given the sample size of 464, the power of the test for our model implies a 70 percent chance of detecting a significant result at a .05 confidence level if the real effect size is .1.

[47] Estimates using only those observations for which we had complete data on the covariates produced no qualitative differences in the results. These estimates are available from the authors; see Roderick Little & D. Rubin, Statistical Analysis with Missing Data (1987).

TABLE 4

REDUCED-FORM TOBIT ESTIMATES AND THEIR MARGINAL EFFECTS OF THE IMPACT OF STATE LICENSING REGULATIONS ON UNTREATED DENTAL DETERIORATION (N = 464)

	DEPENDENT VARIABLE: DOLLAR VALUE OF UNTREATED DETERIORATION/TOTAL DEPRECIATION							
INDEPENDENT VARIABLE	(1)	Marginal Effects (2)	(3)	Marginal Effects (4)	(5)	Marginal Effects (6)	(7)	Marginal Effects (8)
High regulation	...	...	−.065	−.045	...	...	−.023	−.016
			(.073)				(.086)	
Medium regulation	...	...	−.116*	−.081	...	...	−.081	−.057
			(.056)				(.067)	
Restrictiveness of statute	.008	.006	...	...	.010*	.007	...	...
	(.005)				(.005)			
Pass rate	.004	.003	...	...	.002	.001	...	...
	(.003)				(.005)			
Income per family member	−.003	−.002	−.003	−.002	.001	.001	.001	.001
	(.002)		(.002)		(.002)		(.002)	
Education	−.023*	−.016	−.023*	−.016	−.028*	−.01	−.027*	−.019
	(.012)		(.012)		(.012)		(.011)	
Insurance coverage	...	...	...	...	−.259*	−.183	−.261*	−.184
					(.055)		(.056)	
Academic ability of dentists in the state	...	...	...	...	.016	.011	.004	.003
					(.056)		(.053)	
Fluoridation	...	...	...	...	.0003	.0002	.0003	.0002
					(.001)		(.001)	
Constant	.232		.673*		.856		1.04*	
	(.353)		(.163)		(.739)		(.417)	
Log likelihood	−348.58		−347.51		−327.19		−326.99	
Likelihood ratio test for joint significance of restrictiveness variables	1.82		3.96		1.59		1.99	
Mean and standard deviation of the dependent variable	.35							
	(.36)							

NOTE.—Estimated with controls for gender, race, age, childhood in military, and missing values. Standard errors in parentheses and include corrections for group biases.

* Significant at the .05 level.

ginal effects include standard errors corrected for grouped data.[48] Pass rates in all specifications are found to be statistically insignificant. We also show the effect of the categorical variables of high and medium restrictiveness relative to a regime of less tough regulation. These specifications find that only medium regulation is significant and negative on untreated deterioration in column 3 but is not significant in column 7 when additional variables are added that control for demand-side factors. We also used a maximum-likelihood test for the joint significance of all the licensing-related variables that include the pass rate and the statutory variables. The results presented at the bottom of Table 4 show that these variables together are also not significant.[49] The only consistently significant variables in our models were dental health insurance and the education level of the head of the household. The insurance results are consistent with outcomes from health insurance experiments.[50]

As an additional sensitivity test, we dropped the top 5 percent of the individuals with highest untreated deterioration from our sample. Appendix Table A3 presents these estimates, and they show no substantive change in the basic result. An additional test divided the data into three categories by income of the head of the household; it showed no effect of regulation on dental outcomes. There were no greater effects of regulation for higher or lower income groups, suggesting that regulation does not serve to provide greater service quality for low-income groups.[51]

Sensitivity tests also included a subsample of those persons who did not move and therefore had no change in their regulatory regime; this included 363 individuals. The estimates again showed no statistically significant effect of any licensing variables, but the effects of dental insurance again were statistically significant. We also interacted the pass rate with the mean entrance exam scores for the state dental schools, and this variable was not significant in any of the specifications presented in Table 4. Additional tests of the robustness of the estimates controlling for unobserved heterogeneity

[48] Additional specifications that included controls for the interaction of the licensing variables and income showed no substantial changes in the results. We also used just the summated rating scale without dollar value for the procedure and found no effects of the licensing variables. See also Brent R. Moulton, Random Group Effects and the Precision of Regression Estimates, 32 J. Econometrics 385 (1986).

[49] These estimates used national prices construct the dependent variables. In Appendix Table A2 we use state-by-state prices to construct the same variables. The results are similar to those in Table 4. Adding price as an independent variable showed no major changes for our measures of regulation.

[50] Joseph P. Newhouse, Free for All? Lessons from the RAND Health Insurance Experiment (1993).

[51] These estimates are available from the authors.

by economic status showed no large or significant effects of occupational licensure on untreated deterioration.[52]

As additional checks, we use two other more aggregate measures of dental service quality in Table 5. First, we use the ratio of the complaints filed against dentists at each of the state licensing boards to the number of dentists in the state as the dependent variable. Second, we use the average malpractice insurance rates in a state for a dentist with 10 years experience as a dependent variable. Independent variables include state economic and demographic variables such as average education in the state, percent minority, age and age^2, per capita income, fluoridation, and the test scores for new dental students in the state, as well as measures for the levels of restrictiveness of state licensing. The coefficients for none of the licensing variables are statistically significant in Table 5.

In Table 6 we address the issue raised in the theoretical model in Figure 1 regarding the role of regulation on the supply of dentists. In this specification the dependent variable is the log change in the number of dentists per capita from 1980 to 1990, the principal period for the analysis of the sample of Air Force recruits. Consistent with stock-adjustment or cobweb models of the labor market,[53] the independent variables are the logarithm of per capita income in the state, the logarithm of the dentists per capita in 1980, and measures of regulation that include the state pass rate for dentists and indices of the relative levels of overall dental regulation. These estimates are consistent in showing that higher levels of regulation are associated with smaller changes in dentists per capita. The levels of regulation variables, consistent with Figure 1, show that greater regulation is associated with fewer dentists. The pass rate variable in column 1 is statistically significant and positive, suggesting that higher pass rates are associated with greater changes in dentists per capita in the state. Using the estimates of the long-run effect multiplier from the model, the estimated effect of a

[52] In a manner similar to Richard B. Freeman & Morris M. Kleiner, The Impact of New Unionization on Wages and Working Conditions, 8 J. Labor Econ. S8 (1990), we grouped all those individuals from families who had (*a*) incomes in the upper one-third of our income and education distribution and (*b*) dental insurance, and then created pairs of observations. These individuals are assumed to have common socioeconomic characteristics. We then divided individuals within these categories into groups from states that had the most and least rigorous licensing standards, creating a set of paired observations by individuals who were the most similar based on their incomes. We then examined their untreated deterioration values. Again, we could find no statistically significant differences in untreated deterioration between those groups in high- and low-regulated states. However, for individuals who were in the lowest income groups the mean value of untreated deterioration was 2 percent lower relative to those persons who had lived in states with more regulation. This result was not statistically significant using a difference-in-means test.

[53] Richard B. Freeman, Legal Cobwebs: The Changing Market for Lawyers, 57 Rev. Econ. & Stat. 171 (1975).

TABLE 5

ORDINARY LEAST SQUARES ESTIMATES OF THE IMPACT OF STATE LICENSING REGULATIONS ON STATE COMPLAINT RATES AND MALPRACTICE INSURANCE PREMIUMS ($N = 50$)

	DEPENDENT VARIABLE			
	Complaints/Dentists		Log Insurance Premiums	
INDEPENDENT VARIABLE	(1)	(2)	(3)	(4)
Restriction index of statute	.02	...	.0004	...
	(.009)		(.025)	
Pass rate	.002	...	−.007	...
	(.004)		(.010)	
High regulation	...	−.04	...	.07
		(.08)		(.21)
Medium regulation	...	−.11	...	−.11
		(.06)		(.16)
State per capita income	−.017	−.0007	.13*	.14*
	(.014)	(.014)	(.04)	(.04)
Academic ability	.02	.018	−.10	−.04
	(.05)	(.046)	(.14)	(.13)
Fluoridation	.0004	.0001	−.003	−.004
	(.0008)	(.0008)	(.002)	(.002)
Constant	7.64	11.55	10.74	18.65
	(13.64)	(13.32)	(38.03)	(36.81)
R^2	.13	.13	.28	.30
F-test for joint significance of the restrictiveness variables	2.07	2.22	.26	.77
Mean and standard deviation of the dependent variable	.29		$1,912	
	(.13)		(769)	

NOTE.—Estimated with controls for state-level measures of education, percent minority, average age of residence in the state, and age^2. Standard errors are in parentheses.

* Significant at the .05 level.

10 percent increase in the pass rate is to increase dentists per capita by 2 percent.

Overall, our results show that licensing does not improve dental health outcomes as measured by our sample of dental recruits. Moreover, treatment quality does not appear to improve significantly on the basis of the reduced cost of malpractice insurance or a lower complaint rate against dentists, where regulation is more stringent. Finally, stricter regulations are associated with reduced dentists per capita in a state.

E. Effect of Tougher Regulations on the Prices of Dental Care and Earnings of Practitioners

One of the key issues in occupational licensing has been the role of tougher regulations on dental service prices. We estimate price equations

TABLE 6

IMPACT OF OCCUPATIONAL REGULATION ON THE CHANGE IN THE NUMBER OF DENTISTS PER CAPITA BY STATE, 1980–90 (N = 50)

	DEPENDENT VARIABLE: LOG CHANGE IN DENTISTS PER CAPITA	
INDEPENDENT VARIABLE	(1)	(2)
Pass rate	.003*	
	(.001)	
High regulation		−.04
		(.04)
Medium regulation		−.04
		(.03)
Log of state in income per capita in 1990	.16	.11
	(.10)	(.10)
Log of dentists per capita in 1980	−.17*	−.16*
	(.07)	(.08)
Constant	−1.09	−.38
	(.90)	(.85)
R^2	.23	.17

NOTE.—Estimated using data from the 1980 and 1990 U.S. Statistical Abstracts. Standard errors are in parentheses.
* Significant at the .05 level.

using both state and our individual-by-state observations. Our reduced-form price equation assumes that prices of the most common dental services in a state are a function of both supply and demand factors in the state. In our model, regulation can increase prices both by enhanced demand through better visits and by supply restriction through the control of new dentists or migrants. In either case, prices are assumed to increase. The basic model is specified as follows:

$$P_j = X_j\omega + R_j\mu + \varepsilon_i, \tag{11}$$

where P is the logarithm of the price for dental services in state j, X_j is a vector of state supply and demand characteristics that influence the price of dental services in state j, including income in the state, the average age and education of the population, percent minority, percentage of state with fluoridation, and the quality of dentists; R_j are measures of state licensing effect measured as licensing requirements and a category of states with especially heavy levels of regulation; ω and μ are unknown parameter vectors; and ε_i is an i.i.d. error term.

The OLS regression estimates of the effect of supply and demand factors as well as licensing regulations on the prices of filling a cavity and provid-

TABLE 7

ORDINARY LEAST SQUARES ESTIMATES OF THE IMPACT OF STATE LICENSING REGULATIONS ON THE LOGARITHM OF PRICES OF DENTAL SERVICES ($N = 50$)

	Dependent Variable: Log Price of Filling a Cavity		Dependent Variable: Log of Weighted Price of the Most Common Procedures in the Air Force Sample	
Independent Variable	(1)	(2)	(3)	(4)
Restriction index of statute	.01	...	.009	...
	(.008)		(.008)	
Pass rate	−.01*	...	−.01*	...
	(.003)		(.003)	
High regulation	...	.11*	...	.11*
		(.06)		(.06)
State per capita income	.03*	.04*	.04*	.05*
	(.01)	(.01)	(.01)	(.01)
Academic ability	−.04	−.03	−.03	.03
	(.05)	(.04)	(.04)	(.04)
Fluoridation	−.001	−.001	−.001	−.001
	(.0007)	(.0008)	(.0007)	(.001)
Constant	−4.97	8.01	−4.35	7.72
	(12.14)	(13.34)	(11.31)	(12.31)
R^2	.60	.48	.64	.54
F-test for joint significance of the restrictiveness variables	7.99*	...	7.73*	...
Mean and standard deviation of the dependent variable ($)	43.10		47.42	
	(8.04)		(8.67)	

NOTE.—Estimated with controls for state-level measures of education, percent minority, average time of residence in the state, and age^2. Estimates of high regulation relative to medium and low regulation are presented. There are no significant effects of high and medium regulation relative to low. Standard errors are in parentheses.

* Significant at the .05 level.

ing the most needed dental services by the Air Force recruits are presented in Table 7. The estimates shown in the first two columns relate the effect of licensing variables, measured both as pass rates and statutory provisions, on the state prices of a standard dental filling, the most common corrective dental procedure in the United States. In columns 3 and 4, estimates are geared to the dental correction needed in our sample. Each corrective procedure was weighted by its use in the Air Force sample and priced by state to form estimates of the weighted average cost of those procedures in each state, which is the dependent variable.

The log dental price regressions in Table 7 show that tougher licensing, as measured by the pass rate or the overall measure of restrictiveness of the state, is associated with an increase in prices. Using the results from the

table, a state that changed from a low or medium to highest restrictiveness could expect to see an increase in the price of dental services of about 11 percent. This result is in the low range of estimates of between 8.5 and 18 percent found by Shepard in the 1970s for the effect of more restrictive dental licensing on prices[54] and is consistent with the statistical results cited in the literature review. We also simulated the effect of a person in Kentucky, a low-regulation state, with one standard deviation above average dental deterioration using the Air Force recruits' data, and assumed that he had his dental corrections performed in California—a state with tough licensing laws and procedures. The effect would be to increase the overall costs by $1,630 for the types of dental procedures this person needed, after adjusting for general price-level differences in the two states.

Given the increase in prices shown in Table 7, are there similar increases in hourly income or salaries by dental practitioners? In Table 8 we use data from the 1 percent sample from the 1990 Public Use Sample from the census to attempt to answer this question. We obtained the individual files from all persons in the data set who listed themselves as private-practice dentists with their hours worked in dentistry, total earnings from dentistry, and other socioeconomic characteristics. There were 3,361 such dentists in the sample who made over $5,000 from their dental practices and were under 65 years of age, our criteria for inclusion. This is the cohort that was most likely to have treated the persons in the Air Force sample.

In Table 8 we estimate the effect of pass rates and state statutes or, alternatively, the effect of being in a high- or medium-regulation state relative to a low-regulation state on the usual hourly earnings of the Public Use Sample dentists.[55] In columns 1–4, we present the estimated wage equation with controls for standard human capital variables, the mean scores of the entering dentists to the major dental school in the appropriate state, and a dummy variable for whether that state was part of a regional testing program in 1990 (when these programs became widespread). The standard errors are corrected for grouped data.[56] We find in columns 1 and 2 that a 10 percent increase in the pass rate is associated with a significant 6 percent decrease in hourly dental earnings. The results using categorical variables in column 3 show that dentists in the most regulated states earn a statistically significant 12 percent more than practitioners in the least regulated

[54] Shepard, *supra* note 1.

[55] We also estimated the equations with average annual earnings from Steven Ruggles *et al.*, Integrated Public Use Microdata Series (IPUMS), Ver. 2.0 (1997), as the dependent variable and found similar results to those presented in Table 7.

[56] Moulton, *supra* note 48.

TABLE 8

ORDINARY LEAST SQUARES ESTIMATES OF THE IMPACT OF STATE LICENSING REGULATIONS ON HOURLY EARNINGS FROM DENTISTRY (N = 3,361)

	DEPENDENT VARIABLE: LOG OF HOURLY EARNINGS			
INDEPENDENT VARIABLE	(1)	(2)	(3)	(4)
Intercept	−.55	−.75	−1.28*	−1.29*
	(.46)	(.46)	(.37)	(.36)
High regulation	...	...	.12*	.11*
			(.04)	(.04)
Medium regulation	...	...	.03	.03
			(.03)	(.04)
Restrictiveness of statute	−.01	−.01	...	...
	(.01)	(.02)		
Pass rate	−.006*	−.005*	...	...
	(.002)	(.002)		
Female	−.45*	−.45*	−.45*	−.45*
	(.05)	(.05)	(.05)	(.05)
Nonminority	.20*	.21*	.20*	.21*
	(.06)	(.06)	(.05)	(.06)
Age	.16*	.16*	.16*	.16*
	(.01)	(.01)	(.01)	(.01)
Age^2	−.002*	−.002*	−.002*	−.002*
	(.0001)	(.0001)	(.0001)	(.0001)
Citizen	.14*	.14*	.14*	.14*
	(.06)	(.06)	(.05)	(.06)
Married	.20*	.20*	.20*	.20*
	(.04)	(.04)	(.04)	(.04)
Academic ability	.05	.07	.08	.08
	(.05)	(.05)	(.05)	(.04)
Region	No	Yes	No	Yes
R^2	.20	.20	.20	.20
F-test for joint significance of the restrictiveness variables	4.82*	4.09*	6.21*	5.47*
Mean and standard deviation of the dependent variable	41.02			
	(43.58)			

NOTE.—Estimates include a dummy for those states that were part of a regional testing service. Standard errors are in parentheses and include corrections for group biases.

* Significant at the .05 level.

states. We add controls for the major census region in which the dentists lives in column 4 of the table to control for regional effects that our other variables may not be capturing. With these additional controls the estimate falls to a still statistically significant 11 percent using the categorical variables for state regulation. Alternative estimates with varying specifications using pooled state time-series data gave similar results.[57] The estimates

[57] We used state-level data from the American Dental Association published in Council on Dental Education, Suppl. 11 to the Annual Report 86/87 1–27 (1987), along with data

from the table show that dentists could increase their wages by practicing in the most restrictive states.

II. Conclusions

We have analyzed the effect of stricter occupational licensing requirements on economic outcomes, dental prices, and earnings using dental records of the consumers of these services. Prior studies failed to examine fully the potential benefits of the licensing process, including the potential increase on both quality and quantity of service sector outputs. Initially, we reviewed the empirical literature on occupational licensing. Next, we sketched a model linking regulation to the flow of new dentists as well as to quality and prices. We then developed necessary data using an especially designed instrument that linked Air Force recruit dental exams with socioeconomic characteristics. Alternative multivariate statistical models were used to test the effect of more restrictive licensing provisions, first on dental outcomes and then on the prices of dental service prices and practitioner earnings.

Given the model in Figure 1, we are able to provide some evidence on how tougher dental regulation reduces the flow of dentists to the states over time. We also show that stricter regulation raises prices but has no effect on untreated deterioration. If our model is correct, this occurs through higher quality dental visits and hence greater demand at any full price, an unobservable in our data. On the other hand, more stringent regulation does not appear to affect some indirect measures of service quality, such as lower malpractice premiums or fewer patient complaints. We leave to future research to show how, or if, this relationship can be empirically verified.

Our multivariate estimates show that increased licensing restrictiveness did not improve dental health, but it did raise the prices of basic dental services. Further, using several tests for the robustness of our estimates, we found that the states with more restrictive standards provided no significantly greater benefits in terms of lower cost of untreated dental disease. Our estimates of the price equations show that more regulated states have somewhat higher dental prices. In addition, more regulated states have dentists with higher hourly earnings. These results are consistent with the view

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from the U.S. Census Bureau, Statistical Abstract of the United States (1988), in a pooled time-series estimate of high and medium versus low levels of regulation from the 38 largest states from 1978 to 1987 (the only years for which we could obtain full data for all of our covariates) on the log of dentists incomes. We found a coefficient value of .10 (SE = .06) with controls for state per capita income, academic ability of dental school entrants, level of fluoridation in the state, education level, percent minority, average age of the residence in the state, and age^2. These results are available from the authors.

that tougher licensing standards imposed by the most rigid state statutes and administrative procedures may be an unnecessary restriction on entry with little to no benefit to the public. Consequently, moving toward more restrictive policies that limit customer access to these services could reduce the welfare of consumers.

These results do not provide evidence to support or reject the overall efficacy of occupational licensing as an institution relative to a regime of, for example, certification that does not restrict occupational entry by statute. Rather, our analysis addresses only the potential costs and benefits to consumers of developing more rigid standards in states that have relatively relaxed ones. To the extent that states are considering a reduction in the pass rate on dental exams or making it more difficult for out-of-state practitioners to enter, our analysis suggests that there would be no gains to consumers in terms of overall dental health. Further, although our analysis applies mainly to dental care of young adult patients, we also provide some evidence for the general population. We encourage more analysis of the type employed in this paper for other highly regulated occupations so that economists, consumers, and policy makers can more accurately assess the potential outcomes of licensing practices.

APPENDIX

TABLE A1

ESTIMATES OF A MODEL OF DENTAL HEALTH BASED ON INDIVIDUAL DEMAND-TOBIT ESTIMATES: TOTAL DENTAL DEPRECIATION ($N = 464$)

	DEPENDENT VARIABLE: LOG DOLLAR VALUE OF TOTAL DEPRECIATION		DEPENDENT VARIABLE: LOG DOLLAR VALUE OF TOTAL INCOME	
INDEPENDENT VARIABLE	(1)	(2)	(3)	(4)
Total depreciation	...	...	.095*	.094*
			(.009)	(.009)
High regulation	...	−.50	...	−.67
		(.51)		(.41)
Medium regulation	...	−.23	...	.039
		(.42)		(.37)
Restrictiveness of statute	−.01	...	−.01	...
	(.031)		(.05)	
Pass rate	−.03	...	.05	...
	(.025)		(.02)	
Price of prevention	−.0009	.002	.002	.007
	(.004)	(.005)	(.005)	(.010)
Price of correction	.019	.011	.005	.002
	(.021)	(.012)	(.03)	(.016)
Income per family member	−.0008	−.001	−.002	−.001
	(.009)	(.009)	(.012)	(.02)
Education	.032	.034	.134*	.14*
	(.055)	(.055)	(.071)	(.07)
Insurance coverage	−.203	−.191	.859*	.869*
	(.222)	(.222)	(.282)	(.282)
Academic ability of dentists in the state	.081	.053	.534	.375
	(.292)	(.267)	(.369)	(.337)
Fluoridation	.003	.003	.005	.005
	(.003)	(.003)	(.003)	(.003)
Constant	.205	2.94	−9.06	−3.48
Log likelihood	−987.45	−987.17	−990.59	−990.04
Likelihood ratio test for joint significance of restrictiveness variables	1.23	1.80	2.49	3.57

NOTE.—Estimated with controls for gender, race, age, childhood in military, and missing values. Standard errors are in parentheses and include corrections for group biases.

* Significant at the .05 level.

TABLE A2

REDUCED-FORM TOBIT ESTIMATES AND THEIR MARGINAL EFFECTS OF THE IMPACT OF STATE LICENSING REGULATIONS ON UNTREATED DENTAL DETERIORATION (N = 464): DOLLAR VALUES FROM STATE-LEVEL PRICES

	DEPENDENT VARIABLE: DOLLAR VALUE OF UNTREATED DETERIORATION/TOTAL DEPRECIATION							
INDEPENDENT VARIABLE	(1)	Marginal Effects (2)	(3)	Marginal Effects (4)	(5)	Marginal Effects (6)	(7)	Marginal Effects (8)
High regulation	...	...	−.066	−.046	...	...	−.02	−.02
			(.073)				(.09)	
Medium regulation	...	...	−.118	−.082	...	...	−.08	−.06
			(.056)				(.07)	
Restrictiveness of statute	.008	.006	...	...	.010	.007	...	...
	(.005)				(.005)			
Pass rate	.004	.003	...	...	.002	.001	...	...
	(.003)				(.005)			
Income per family member	−.003	−.002	−.003	−.002	.001	.001	.001	.0001
	(.002)		(.002)		(.002)		(.002)	
Education	−.023*	−.016	−.023*	−.016	−.028*	−.02	−.027*	−.02
	(.012)		(.011)		(.010)		(.01)	
Insurance coverage	...	...	...	...	−.26*	−.18	−.26*	−.18
					(.06)		(.06)	
Academic ability of dentists in the state	...	...	...	...	.02	.01	.004	.003
					(.06)		(.053)	
Fluoridation	...	...	...	...	.0003	.0002	.0002	.0002
					(.001)		(.001)	
Constant	.231		.675		.865		1.041	
	(.345)		(.146)		(.740)		(.42)	
Log likelihood	−348.60		−347.48		−327.18		−326.97	
Likelihood ratio test for joint significance of restrictiveness variables	1.83		4.07		1.60		2.02	

NOTE.—Estimated with controls for gender, race, age, childhood in military, and missing values. Standard errors are in parentheses and include corrections for group biases.

* Significant at the .05 level.

TABLE A3

REDUCED-FORM TOBIT ESTIMATES AND THEIR MARGINAL EFFECTS OF THE IMPACT OF STATE LICENSING REGULATIONS ON UNTREATED DENTAL DETERIORATION ($N = 441$): DELETING OUTLIERS AT THE TOP 5%

	DEPENDENT VARIABLE: DOLLAR VALUE OF UNTREATED DETERIORATION/TOTAL DEPRECIATION							
INDEPENDENT VARIABLE	(1)	Marginal Effects (2)	(3)	Marginal Effects (4)	(5)	Marginal Effects (6)	(7)	Marginal Effects (8)
High regulation	...	...	−.073	−.049	...	...	−.02	−.01
			(.075)				(.09)	
Medium regulation	...	...	−.101	−.068	...	...	−.07	−.04
			(.055)				(.07)	
Restrictiveness of statute	.009	.006	...	...	.010	.007	...	...
	(.005)				(.005)			
Pass rate	.005	.003	...	...	.003	.002	...	...
	(.003)				(.005)			
Income per family member	−.002	−.002	−.003	−.002	.001	.001	.001	.001
	(.002)		(.002)		(.002)		(.002)	
Education	−.023*	−.016	−.023*	−.016	−.028*	−.02	−.027*	−.02
	(.011)		(.011)		(.010)		(.01)	
Insurance coverage	...	...	...	...	−.24*	−.17	−.25*	−.17
					(.05)		(.01)	
Academic ability of dentists in the state	...	...	...	...	.02	.01	−.002	−.001
					(.06)		(.056)	
Fluoridation	...	...	...	...	.0006	.0004	.0005	.0003
					(.001)		(.001)	
Constant	.086		.625		.569		.933*	
	(.336)		(.141)		(.759)		(.43)	
Log likelihood	−329.67		−329.50		−309.53		−309.88	
Likelihood ratio test for joint significance of restrictiveness variables	2.45		2.81		1.89		1.18	

NOTE.—Estimated with controls for gender, race, age, childhood in military, and missing values. Standard errors are in parentheses and include corrections for group biases.

* Significant at the .05 level.

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DOES REGULATION IMPROVE OUTPUTS AND INCREASE PRICES?: THE CASE OF DENTISTRY

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ABSTRACT

This study examines the role of variations in occupational licensing policies and practices in improving the outputs of services provided to consumers, and the effect of restrictive regulations on the prices of certain services. Theory suggests that more restrictive licensing may raise prices, but that it may also raise demand by reducing uncertainty about the competency of the services. This paper uses unique data on the dental health of incoming Air Force personnel to empirically analyze the effects of varying licensing stringency among the states. We find that tougher licensing does not lead to improved outputs, but does raise prices. Our results cast doubt on the principal public interest argument in favor of the impact of more strenuous licensing practices of the more restrictive states.

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I. Introduction

Do more restrictive occupational licensing statutes and administrative procedures affect the quality of services received by consumers? Are the quality effects of restrictive occupational licensing provisions similar across income groups? Do tougher occupational licensing provisions increase the prices of the services provided?

There are two major views on restrictive licensing statutes. One view is that more restrictive licensing is an unnecessary barrier on the entry of individuals to occupations that serves mainly the interests of practitioners, with little or no benefit to the public [Shepard, 1978]. The main effects are assumed to drive up prices with potentially a negative impact on the quality of services received by consumers [Friedman and Kuznets, 1945]. The other perspective is that occupational licensing is necessary to reduce uncertainty in the minds of consumer as to the quality of the product [Arrow, 1971]. In this view, licensing also is seen as a way of further enhancing the formation of human capital which is perceived as being the primary method to enhance the quality of services provided [Shapiro, 1986]. Information asymmetry between sellers and consumers makes licensing a way of improving service quality. It also improves service by truncating the bottom of the quality distribution. Unfortunately, no rigorous empirical analysis has been able to answer these questions for a major occupation in the United States. In this study we examine the effect of relatively more restrictive licensing statutes and administrative practices on the quality of services rendered and on the prices of those services.

The general policy impact of occupational licensure has grown dramatically: from approximately 70 occupations in 1950 to over 500 in the late 1970s covering about 18 percent of

the U.S. work force [Kleiner, 1990]. With the shift to a more service-oriented economy, this licensed sector is expected to grow more rapidly than the rest of the economy. One argument holds that more rigorous regulatory devices have been used by these occupations to capture economic rents. Moreover, for low-income individuals in the United States, the issue of access to quality services in the regulated sector of the labor market, and the net impacts of highly restrictive licensing practices, have long been subjects of controversy [Rottenberg, 1980].

There are also international policy ramifications of state-by-state licensing in the United States For example, the licensing of occupations has been cited as a significant issue in recent trade/tariff negotiations between the United States and its major trading partners. The European Union has asserted that U.S. state-by-state licensing is an unnecessary impediment to the free movement of workers, while United States negotiators have argued that these restrictions maintain an adequate quality of services for Americans [Wall Street Journal, 1990].

Studies have compared the economic costs of state-by-state licensing relative to a system of nationwide endorsement where practitioners who are licensed in one state are admitted to practice in all other states without additional restrictions [Pashigian, 1980; Kleiner, Gay, and Greene, 1982]. A policy of nationwide endorsement represents a potential policy reform, since the proposal is often supported by a majority of the members of a profession relative to deregulation and could be adopted by national professional associations as a labor market policy. Before these types of policies are recommended, however, the balance of economic costs and benefits of the current system of occupational licensure needs to be examined.

Our analysis of occupational regulation finds that tougher state regulations for dentists are not associated with any improved quality of outputs for either new Air Force recruits or the

general population. Further, our state level estimates show that tougher regulations are associated with higher prices for certain services, and somewhat higher salaries. These estimates are consistent with theoretical models of occupational regulation that imply higher costs to consumers with few benefits.

In this study we analyze the impact of tougher occupational licensing standards on measured dental outcomes and on the prices of services. Initially, we review the empirical literature on occupational licensing, which mainly focuses on the costs to consumers resulting from restrictions to entry and interstate mobility. Next, we present a model linking regulation to the flow of new dentists as well as to quality and prices. In the section that follows, we develop the concepts and the data used to estimate that model. We then specify alternative multivariate statistical models of the impact of more restrictive licensing provisions; first, on the quality of dental outputs, and then the prices of certain dental services. Our conclusions summarize our key results and present tentative policy implications.

A. Previous Results

Although many theoretical and empirical studies have examined the impact of occupational licensing on costs, relatively few studies have investigated the benefits that different forms of licensing may have by promoting higher quality services. This section will briefly review some of the major studies that have estimated the costs of licensing. We consider both theory and empirical evidence of the effects of licensing provisions on costs to the consumer. We will then review studies examining theoretical and empirical work on occupational licensure's potential benefits to consumers.

Several cost-focused studies have analyzed how occupational licensing affects the public interest [Maurizi, 1974]. Using data from the 1940s and 1950s, Maurizi regressed examination pass rates on a measure of excess demand for entry into a number of professions, among them dentistry. The evidence from pooled regressions supports the premise that licensing boards' power was used to maximize gains from excess demand for dental services.

A study specifically focused on dentistry estimated the costs of licensing on consumer surplus [Boulier, 1980]. The results from the model estimated both price and quantity equations using cross-sectional data of dental services in the 1960s as well as economic welfare gains. His main results indicate that removing licensing constraints on the mobility of dentists would raise the average price of dental services and reduce aggregate quantity of services produced nation-wide, but the reallocation of dentists would yield an increase in consumers' surplus and in the mean net incomes of dentists.

Shepard [1978] showed that the most restrictive state practices have caused the cost of dental care to increase significantly relative to less regulated states. Specifically, the study concludes that where regulatory authorities have constructed barriers to entry, dentists systematically raise fees. Overall, the annual national costs to consumers of dental services of this form of professional control was estimated at $700 million in the mid-seventies.

In spite of the apparent costs, the practice of licensure by state governments continues to grow, and policy makers seem to think that these practices have beneficial effects for their constituents. Proponents of stricter licensing standards, who often include the members of the licensed occupations, suggest that the quality of service offered is enhanced by making standards tougher.

It has been suggested that too much research effort has been directed at the effects of barriers to entry and too little on issues such as demand and the potential output effects [Benham, 1980]. Unfortunately, studies examining the potential benefits of occupational licensing have been hampered either by the difficulty of obtaining covariates or other data limitations. Often, the quality of licensing is measured by inputs rather than outputs [Carroll and Gaston, 1981]. For example, quality proxies in dentistry typically measure professionals' measures of their own busyness, rather than direct measures of dental health.

Arlene Holen attempted to measure the direct impact of more stringent licensing requirements on the quality of dental care by using data gathered from individual dental records [Holen, 1978]. Her results suggest that the benefits of licensing include: reduced probability of adverse outcomes, reduced variability in service quality, and greater consumer satisfaction. Holen's most persuasive measure of dental service quality was the amount of untreated or currently existing dental disease in U.S. Navy personnel. Unfortunately, there was no attempt to incorporate the impact of treatment price variation on this measure, although the theoretical literature suggests that price is critical in testing this relationship. Furthermore, many controls were either infeasible or otherwise not included in the Holen study. No control variables were included for whether this was their first encounter in the Navy dental system, socioeconomic status, geographic mobility, gender, race, previous places of residence, or dental insurance coverage.

In fact, a substantial part of their dental service may have been received in parts of the country far removed from their place of enlistment into the Navy. The assumption implicit in the empirical work was that all of the individual's dental care was received in the state in which he

lived prior to enlisting in the Navy. However, given the mobility of most Americans, this is an assumption that may limit the implications of the results toward states with nearby naval stations. Finally, the analysis does not include controls for the quality of the incoming pool of dentists into dental school and subsequent licensing. Clearly, the major gap in our knowledge of occupational regulation is in the effects of the alleged benefits of these policies and practices.

B. Analyzing Licensure Effects on Demand

Since the theory of entry reduction of the price of services is well developed, we will focus this section on the development of models that examine the quality and quantity of output [Scherer and Ross, 1990]. Current theory and evidence provide results that are inconclusive about the effects of occupational licensing upon the improvement of service sector outputs. To arrive at conclusions concerning overall economic welfare, one must understand the manner in which the institutional imposition of licensure affects supply and demand in specific markets. This analysis aims primarily at discovering the extent to which individuals' dental outcomes are affected by licensing restrictions on the occupation providing the service inputs. From this information we can develop a model to explore whether direct benefits or losses accrue to the consumer from licensing statutes.

Although this study focuses primarily on demand side effects, we do control for dental service prices in our model. Our estimates provide information on the extent of the fulfilment of the stated intention of pro-regulatory policy. If stricter occupational licensure does provide the consumer with information about higher minimum quality in the service markets, observable demand shifts should result from increasing the restrictiveness of licensure.

C. Output Measures and Consumer Welfare

To test whether a consumer has directly benefitted from more or less occupational licensure depends upon the model capturing the major characteristics of the services. These are the flows of services consumed -- often consumed for many years after the initial investment occurred. Thus, our demand model requires measures of multiple attributes of service outputs consumed. While such gauges might be termed quality measures, we will devise composite measures of dental health for the empirical model that are subject to continuous measurement.

Many studies of service demand have attempted to overcome the problem of variability in service output by making quality adjustments based on characteristics of inputs. However, there is no guarantee that the services actually received by consumers are positively correlated with these proxy measures of input productivity, and the distinction between the number of inputs employed and the quality of output received are quite important. A dental example can establish the distinction between input and the final product. An inferior dentist may require multiple attempts to fill a tooth while another dentist requires only one [Oi, 1973]. Thus, if we define output in terms of frequency of visits or amount of material used in performing the repair, there is apparently a greater demand for the inferior service. This apparent paradox is resolved by recognizing that the consumption of many health services (outputs) continues far beyond service delivery. Instead of measuring the number of separate visits or fillings inserted, suppose we examine the dental condition a number of years after the intervention. From this perspective, an individual treated by the inferior dentist and one by the more skilled dentist may be observed to have one filled tooth. Therefore, we can infer that the output of services made possible by the original investments has been identical, regardless of input activities.[1]

More appropriate research measures of quality can be developed by considering the stock of dental health status HS. Let the depreciation rate of that stock per period as DR. DR lies between zero and one. Then, assuming a constant depreciation rate:

(1) $HS_t = (1 - DR)^t HS_o$

The depreciation rate, DR, is inversely related to the extent of personal and professional preventative investment made by the individual over t periods. We assume that a significant component of preventative care is service performed by professional agents. Another component is clearly related to the consumer's own service provision.

Cumulative depreciation can be written as

$$TD_t = \sum_{i=0}^{t} DR_i$$

where TD is total depreciation and DR is depreciation per period.

Second, a generalized construct of cumulative investment in corrective services can be specified as follows:

As dental health status depreciates, corrections can be performed to repair damage. Thus, the stock can be, in a sense, replaced at some rate, CR, per period. Then:

$$HS_t = (1 - DR_t + CR_t)HS_{t-1}$$

Assuming a constant rate of net corrective intervention as well as deterioration[2]:

(2) $HS_t = (1 - DR + CR)^t HS_o$ thus we can define untreated deterioration as

$UD_t = HS_0 - HS_t$ [3]

The deterioration of dental health status will vary considerably across individuals because of genetic factors that we cannot control for, as well as for some uncontrolled environmental reasons (i.e., diet, general health status) [Kudrle and Meskin, 1983].

Let all other things be held constant, the rate (1-DR) will be a strictly increasing function of the quality and quality of prevention:

$$(1\text{-}DR) = f(P_1,P_2,P_3)$$

where P_1 = an index of personal preventive intervention

P_2 = an index of public prevention, fluoridation of public water supplies

P_3 = an index of professional intervention, cleaning and sealants

In developing an empirical construct a measure of only one aspect of the three relevant variables, the fluoridation of the water supply in the areas where an individual has lived, is available to us. The other two variables are unobservables in our model that we attempt to capture through the employment of proxies that are known to contribute to personal preventive behavior and a proclivity to use preventive services. We assume that the "tastes" for these services are normally distributed across individuals controlling for various other attributes. The dental care literature suggests that both unobserved prevention investments are positively correlated with family income and the household head's education level [Kudrle and Meskin, 1983].

The role of licensing is assumed to have its greatest impact on P_3 in above equation because preventive services must be delivered under a dentist's supervision in all states, and we assume that views about the quality of dentistry rather than those that might be formed about

ancillary services drives consumer behavior. Moreover, in all states dentists direct, examine, and otherwise monitor all preventative and corrective care.

Licensing restrictiveness has two major effects on practitioners. First, individuals considering entering an occupation in a state may decide not to pursue that option if the pass rate is low. Statutory provisions such as a waiting period, or a retaking of a state portion of a licensing exam if an individual has qualified in another state may further reduce new entrants. Such procedures may increase the average quality of the instate dentists. Second, for most dentists choosing a state in which to locate, the lower pass rate means that they would stay in the state and study to retake exam, thus presumably enhancing their relevant human capital. In both of these cases the average quality of dentists in the state would rise, but prices may also rise because the supply of dentists and access to dental services would be reduced.

D. Analyzing the Impact of Regulation on Outputs

Figure one shows the expected process of how occupational regulation impacts dental health status. Along its upper branch, the figure shows how dental regulation operates through state level pass rates, more restrictive licensing statutes, and reciprocity agreements with other states to restrict the flow of new dentists [Kleiner and Kudrle, 1992]. Over time this could negatively affect the dentist to population ratio in a state. The consequence of restricting entry is to reduce supply and increase the prices of dental services. The same regulatory factors are shown to influence the quality of dental care. Assuming that lower quality dentists are removed as entry restrictions are increased, the mean quality of a dental visit is increased, since the remaining dentists are of higher quality.[4] With this presumed enhancement in quality, the use of their services would increase as perceived quality grew [Leland, 1980]. This factor alone would

directly reduce untreated deterioration as shown in Figure one. However, higher dental prices alone would increase the overall extent of dental deterioration. On balance, the net impact of regulation on dental deterioration is theoretically unclear. The overall impacts on improved outputs of greater regulation needs to be decided with data and analysis.

The basic relationships derived from this analysis would suggest that the quality of a dental visit would be negatively related to the pass rate, PR, (or positively to the stringency of other regulation) in a state. Either lower quality candidates would be rejected by a state or those individuals would incur additional occupation-specific training in order to pass the exam. This relationship is presented in equation 3:

(3) $VQ = f(PR, X_1)$

where visit quality (VQ) is negatively related to the pass rate for dentists, and X_1 is a set of other control variables.

In contrast, an increase in the pass rate would enhance the access to dental services. This would occur as more dentists are available in the state, which would reduce the office waiting time for a visit and the time it takes to travel in order to see a dentist. This would be included in the implicit or full price for a dental visit, which we will call access. This relationship is shown in equation 4.

(4) $FP = f(PR, X_2)$

where FP is the price which includes waiting time, which is influenced negatively by the pass rate,[5] and X_2 is a set of other variables.

Overall dental outputs would be a function of the quality of a dental visit, which is an unobservable in our model, and the access to dental care. Although others within a dental

establishment can provide dental services, all services are under the control, monitoring and direction of a dentist. For example, in all states dental hygienists must work with the guidance of a dentist by statute. Therefore, in equation 5 overall dental condition is a function of access and dental care quality.

(5) $QO = f(FP,VQ,X_3)$

where QO is the dental condition of a person in a certain jurisdiction and X_3 is a vector of other variables. In sum, dental demand depends on: (1) perceived quality, (2) money price, and (3) time price.

E. Concepts and Data

Two major difficulties have plagued previous studies of occupational regulatory effects relating to the modeling of the level of consumer benefits. First, they lacked data detailing statutes and pass rates as measures of restrictiveness for states. Second, they lacked comparative data on the results of services provided. Our data sets focus on both of these issues as well as problems that other researchers have stated should be dealt with in estimating the potential output benefits of occupational licensing.

Initially, we collected detailed statutory information from 1960 to 1987 for dentists, which we obtained from each state's statute codes, and then linked this to similar data gathered by the Council of State Governments [1987].[6] We obtained pass rate data from the American Dental Association. Prior research has shown that the pass rate is the key measure of restrictiveness when other state controls are accounted for [Maurizi, 1974; Getz, Siegfried, and Calvani, 1981; Kleiner, Gay, and Greene, 1982; and Kleiner and Kudrle, 1992].

Previous studies have employed pass rates with incomplete attention to the possible variation in their meaning across states. For example, a low pass rate in California could be controlling dental practice at a higher level of quality than a high pass rate in North Dakota if the average quality of the applicant is higher in California. We have attempted to deal with this problem by including a common quality factor in our estimating equation. All incoming dental students have taken national entrance examinations, and we include the mean incoming score on that examination for the most appropriate dental school for each state.[7] In general, one dental school dominates the production of dentists for a given state. While somewhat approximate, this variable is used to control for the premarket education abilities of the stock of dentists [Neal and Johnson, 1996].

Developing the most appropriate new measures of the dependent and some independent variables used in this analysis involves several steps. First, as stated above we assembled measures for each significant dimension of restrictiveness allegedly contributing to quality enhancement. Time series data are important for many measures because the stock of practitioners at any time is composed of a large number of separate "vintages" that are subject to varying qualifications, although for the period that most of our sample was growing up there was a correlation of .60 for the states maintaining their either high or low level of restrictiveness from the beginning 1960, to the end of period which was 1987.[8] Second, indices were developed that allowed for the assessment of previous and current dental deterioration (TD), the amount of correction (TC) and the amount of correction needed to bring the individual to a disease-free state (TU). A smaller amount of untreated disease implies a higher dental health status.

A licensed dentist worked with us to develop the coding and examined the dental forms for each of the individuals who were examined by Air Force dentists who agreed to be in our sample, ensured that licensing standards and health outcome measures were appropriately specified. Even though we examine the regulatory requirements for becoming a dentist, we note that restrictiveness measures for dentists and hygienists are highly correlated across states using the Council of State Governments measures of these requirements at around a simple correlation of .90.

Because there are likely to be concerns regarding the reliability and validity of various elements of the restrictiveness index, alternative formulations were devised. The indices were devised with the object of maximizing the probable quality of a typical set of services to an individual twenty-one years of age. In the absence of any theory or evidence to the contrary, we assumed that the stringency of professionally administered quality controls such as licensure is the best proxy for quality as recognized by the consumer. We used this measure both independently and as the basis of an overall measure of licensing restrictiveness.

In order to obtain variables for individuals in the specified model we employed a unique source of medical and demographic data from the personnel records of the United States Air Force. In our investigation, we were unable to find any agency in the United States that routinely collects data that can properly control for environmental and demographic factors contributing to varying dental conditions. We collected data on a wide range of demographic and economic variables through a questionnaire administered by Air Force dental personnel to entering recruits. Other analysis has found that the socioeconomic backgrounds of military recruits, including Air Force recruits, very closely match the background of average Americans

[Boesel, 1989]. Data were gathered on the age, gender, race, and household income. The education of the head of the household and household income (corrected by number of members) were especially important because they were known from previous research to affect the demand for dental services [Kudrle, 1980; Kudrle and Meskin, 1983]. Fluoridation affects the incidence of cavities, the single most important dental disease in young people. Because the public water supply can be a major source of fluoride, we obtained residence location and duration from birth until entry into the Air Force from all persons in the sample. Further, we asked new Air Force recruits if their family was covered by dental insurance, and how many times they went to the dentist in the last two years. Place of residence was also used to identify the restrictiveness of dental regulation at the state level.[9]

Table 1 presents the means and standard deviations for the individuals in our sample for licensing and state characteristics. Geographic spread is diverse and the education (12.7 years) and family income ($27,621) of recruits closely matches the country as a whole (12.6 years and $29,458). Our sample contains over 23 percent of nonwhite Americans, but only 17 percent of the individuals in our data set are women.

Further, this sample contains a sufficiently large sample of individuals from low-income households (approximately 22 percent below the U.S. designated poverty level) to allow us to examine the impact of varying licensing procedures on the quality of services received for individuals who may be most adversely impacted by tougher regulation. Consequently, using the Air Force Base sample should enhance the generalizability of our results to other similar cohorts. The exact information obtained from the examinations and coding rules involved a recording of

dental corrections (CR) and any form of current tooth-related deterioration (DR). Periodontal information is not used in the study.[10]

Dental public health specialists have well-developed views about the constituents of health and to some extent their relative importance. In addition to formulation of CR and DR, which dental professionals would regard as appropriate measures of dental outcomes, we also will use a measure of the dollar value of the deviation from a disease-free dental condition [Christen, Park, Groves, Young, and Rahe, 1979]. We use the national average fees for general practitioners obtained from the 1992 survey from Dental Economics as the prices to bring each person in our sample up to the optimal level of dental care. This survey provides state-by-state averages for most major dental procedures for only the 1990s. We will use both the dollar value index and a more conventional index of dental condition developed by dental researchers to examine the robustness of our dual measures. In addition, ratios are developed of untreated dental problems to total dental depreciation and the dollar value of untreated to total depreciation. The means of these values as well as those for most of the other variables are also presented in Table 1.[11]

Since we asked each of the persons in our sample all the places they lived, we are able to create a data set of 464 observations, where each individual observation contains information on household variables and state characteristics weighted by time the person spent in the state. Since there is no clear consensus from the dental establishment regarding which stage of individual development or age has the greatest effect on dental outcomes, our analysis assigns equal weight to each age period.[12] Therefore, for each state observation we give proportional weights to each state characteristic based on how long the individual spent in that state.[13] Measures of heavy,

medium and light regulatory licensing statutes and entrance exams were developed by noting that the average pass rate for the United States was 85 percent. Levels below 80 percent with either no reciprocity or no endorsement provision for out-of-state dentists were termed as being heavily regulated. Medium regulations were those states with pass rates between 80 and 90% and a provision for reciprocity or endorsement. Light regulation included those states with pass rates above 90% and either a provision for reciprocity or endorsement.

One of the major advantages of having a data set like the one we have gathered is the ability to reduce unobserved heterogeneity. Since the group that formed the basis of our measures of dental care quality have similar ages, interests, and career aspirations, this should reduce the unobservable variation relative to a randomly selected grouping of ages, interests, and aptitudes. An analysis of the general population would likely suffer from a wider variation in characteristics, including failing general health, that would be more difficult to control for using standard statistical approaches. Therefore, differences in untreated dental outcomes in our analysis would more likely be explained by economic, environmental, and policy variables about which we have data than large differences in attributes that we cannot measure or observe. Of course, the use of such a select group for our analysis reduces our ability to generalize to the U.S. population. To partially correct for this potential shortcoming and to monitor the results from our selected sample, we use other national data sets to examine quality and price effects. This also serves as additional sensitivity analysis of our Air Force data set.

F. Estimating a Model of Dental Health Based on Individual Demand

We specify the model below to be consistent with our demand model and with Figure 1, which explains regulations' impact on consumer welfare. We specify the following model of individual dental health based on the demand for dental services:

(6) $TD_i = X_{i1}\beta + R_i\delta + \epsilon_i$

(7) $TC_i = X_{i2}\gamma + R_i\eta + \epsilon_i$

First, in equation 6, TD_i is the cumulative depreciation of the individual's dental condition drawn from clinical examination of Air Force recruits and aggregated by the amount of past and present expenditure estimated to bring the teeth for each individual to maximally repaired condition, or alternatively by a count of the number of treated and untreated diseased surfaces and missing teeth. X_{ij} is a vector of personal attributes of the Air Force recruits that include economic and demographic characteristics of the person as well as dental service price. R_i are the measures of state regulation including licensing provisions and county fluoridation measures of each recruit weighted by the length of time the person was in the state or area. β, δ, γ, and η are unknown parameter vectors and ϵ is an i.i.d. error term. Equations (6) and (7) are generated by individual demand for preventive and corrective care, respectively.

The independent variables in equation (6) includes ones that we posit determine personal, public health, and professional contributions to prevention. It should be stressed that the restrictiveness variable in this equation is for dentists only, as is the case in equation (7).

Second, TC in equation (7) is an index of corrective services. The independent variables in equation (7) include all of the variables found in equation (6) except the prevention price variable, which is captured indirectly by the inclusion of the (instrumented) accumulated

depreciation in the equation. In addition, a corrective price variable is employed.[14] An estimate of (6) using a Tobit specification to account for individuals who had no dental problems shows, not surprisingly, that unobservable personal and genetic characteristics dominate overall dental care; the equation is not significant. Unfortunately, the difficulty of explaining total deterioration implies an unsatisfactory instrumental variable which performs poorly in the second stage of an attempt to estimate total correction. An OLS estimate of (7), however, yields coefficient estimates quite consistent with the reduced form estimations to which we now turn.

In its reduced-form equation from equations (6) and (7) we can estimate UD/TD (untreated dental depreciation divided by total depreciation) as follows:[15]

(8) $UD_i / TD_i = X_{i3} \lambda + R_i \pi + \epsilon_i$.

where we have the reduced-form impact multiplier coefficients derived from (6) and (7). In this case the X_i is a vector of characteristics of the Air Force Recruits, R_i is the weighted state and area-specific characteristics of the licensing variables, λ and π are unknown parameter vectors and ϵ_i is the error term.[16]

In large part the variable that is of most interest is the impact of the licensing variables on the amount of untreated dental outcomes at the time the individual entered the Air Force. Because there is likely to be a substitution between preventive and corrective care, the estimates of untreated deterioration divided by total deterioration in reduced form should provide additional insights into the relationship between more restrictive licensing practices and the measures of enhanced dental outcomes.

In Table 2 we present estimates of the impact of licensing pass rates and statutes on the untreated dental outcomes and their marginal effects using a Tobit specification. To maintain as

large a sample as possible, when our questionnaire lacked information on a covariate, we substituted the means for missing values and added a dummy variable which took the value 1 when the mean was put in and 0 otherwise [Little and Rubin, 1987].[17] In our sample 68% had some uncorrected dental deterioration and 90% had some measurable deterioration during their lifetime. Given the number of zero observations in our data set, the Tobit specification corresponds to the appropriate functional form.[18]

The estimates presented for the independent variables in Table 2 are presented in the column along with additional controls for gender, race, and age.[19] Our estimates show that in columns 1 and 3 that the pass rate is not statistically significant. In columns 2 and 4 we show the impact of the categorical variables of high and medium restrictiveness relative to a regime of less tough regulation. All of the specifications consistently show that licensing had no impact on untreated dental deterioration. The only consistently significant variables in our models were health insurance and the education level of the sampled individual.

To test for model robustness, we employed several additional specifications. In one specification we included the dentists to population ratio along with the pass rate and found no significant changes in the results. We then used a maximum likelihood test for the joint significance of all the licensing related variables that include the pass rate, and the statutory variables. The results presented at the bottom of the table show that these variables are also not significant with low chi-squared scores.

We also examined the impact of the dentist to population ratio on untreated deterioration. In this case, we estimated the specified equation on only individuals who had some untreated dental deterioration. This sample included 318 individuals. Using the same model as the one in

Table 2, we found that the relative number of dentists was statistically significant at the .01 level in reducing untreated deterioration with a marginal effect of .08. These estimates suggest that stricter regulation is associated with fewer qualified dentists which, in turn, is related to greater untreated dental deterioration.

Sensitivity tests included a subsample of those persons who did not move and therefore had no change in their regulatory regime. This included 363 individuals in our sample. The estimates again showed no statistically significant impact of any licensing variables, but the effects of dental insurance again were robust. We also interacted the pass rate with the mean entrance exam scores for the state dental schools, and this variable was not significant in any of our specifications.

Next, in order to attempt to further reduce the potential unobserved heterogeneity we grouped all those individuals who had incomes in the upper one-third of our income and education distribution, and had dental insurance and then created pairs of observations [Freeman and Kleiner, 1990]. These individuals may be assumed to have common socioeconomic characteristics. We then divided them into groups that had the most and least rigorous licensing standards, creating a set of paired observations by individuals who were the most similar based on their incomes. We then examined their untreated deterioration values. Again, we could find no statistically significant differences.[20] However, for individuals who were in the lowest income groups the mean values of untreated deterioration was 2 percent lower among those persons exposed to more regulation. The differences were not large by any standard measure.

One argument against tougher licensing standards is that individuals with lower incomes are more likely to be served by lower quality practitioners, and are the group most likely to see

their preferred service quality diminished. In Table 3 we test for this hypothesis by dividing our individual data set into three groups by income strata, and estimate Tobit equations. The last two columns include individuals with the lowest incomes in our data set, and licensing pass rates or statutes are not statistically significant. The variable that again was significant was the presence of insurance coverage. The signs are consistent with the theoretical model. These results do not show that stricter occupational licensing practices and policies has any beneficial impact for any of the income groups in our sample. Furthermore, the maximum likelihood test for the joint significance of the licensing provisions are not different from zero.[21]

As additional checks, we use two other measures of dental service quality in Table 4. In the first data set, we use the ratio of the complaints filed against dentists at each of the state licensing boards to the number of dentists in the state as the dependent variable. Second, we use the average malpractice insurance rates in a state for a dentist with ten years experience as a dependent variable. Independent variables include state economic and demographic variables, as well as measures for the levels of restrictiveness of state licensing. The coefficients for none of the licensing variables are statistically significant in Table 4, consistent with our earlier findings that regulation did not improve dental outcomes.

Overall, our results show that licensing does not improve dental health outputs as measured by our sample of dental recruits. Moreover, while Figure 1 suggests that stricter licensing could increase quality, outputs do not appear to be improved based on the failure of malpractice insurance rates or complaints against dentists to be lower where regulation is more stringent.

G. Impact of Tougher Regulations on the Prices of Dental Care

One of the key issues in occupational licensing has been the role of tougher regulations on dental service prices. We estimate price equations using both state and our individual-by-state observations. Our reduced form price equation assumes that prices of the most common dental services in a state are a function of both supply and demand factors in the state. In this case, regulation can increase prices by either enhanced demand through better visits, or restricting the supply of dentists through the control of new entrants or migrants. In either case, prices are assumed to increase. The basic model is specified as follows:

$$(9) \qquad P_j = X_j\omega + R_j\mu + \epsilon_i$$

where P is the logarithm of the price for dental services faced in state $_j$, X_j is a vector of state supply and demand characteristics that influence the price of dental services in state $_j$ that include income in the state, education of the population, the quality of dentists, and the average age of persons in the state, R_j are measures of state licensing impact measured as licensing requirements and as an overall assignment of heavy, medium, and light levels of regulation, ω and μ are unknown parameter vectors and ϵ_i is an i.i.d. error term.

The ordinary least squares regression estimates of the impact of supply and demand factors as well as licensing regulations on the prices of the most commonly used corrective procedure and for a "market basket" of dental services are presented. The estimates shown in the first two columns of Table 5 relate the impact of licensing variables, measured both as pass rates and statutory provisions, on the state prices of a standard dental filling. This is the most common form of corrective dental procedure in the United States In columns 3 and 4 estimates are presented of the forms of dental correction found in our sample of Air Force recruits. Each

corrective procedure was weighted by its use in the Air Force sample, and priced by state to form the basis of state estimates of the weighted average cost of those procedures in each state. This then forms the basis of the dependent variable for the estimates shown in the Table.

The log of dental price regressions in Table 5 show that tougher licensing, as measured by the pass rate or the overall measure of restrictiveness of the state, is associated with an increase in prices. For example, a ten percent increase in the state pass rate would be associated with a similar reduction in the prices of these measures of dental services. Further, a state that changed from a low level of restrictiveness to one that was in the most restrictive grouping could expect to see an increase in the price of dental services of 14 to 16 percent. This result is in the high range of estimates found by Shepard in the 1970s of the impact of more restrictive dental licensing on prices of between 8.5 and 18 percent [Shepard, 1978], and is consistent with the statistical results of other analysts we cited in the literature review. We also simulated the impact of a person in Kentucky, a low regulation state, with one standard deviation above average dental care using the Air Force recruits' data, and assumed that he had his dental work performed in California -- a state with tough licensing laws and procedures. The impact would be to increase the overall costs by $1630 for the types of dental procedures this person needed, after controlling for income per capita differences in the two states.

We also estimated an equation of the impact of regulation on the logarithm of average dental salaries by state for the period 1978 through 1987. In the final column of Table 5, the estimate of a simple wage model of the impact of licensing on state level dental incomes is presented. We found that moving from a low to a high regulation state was associated with a moderately significant 10 percent income increase using the same controls as those listed in

Table 5 for the price equations. Given the lack of individual level controls and somewhat imprecise estimates these results should be viewed as merely suggestive of the impact of state dental regulation on dental salaries.

II. Conclusions

We have analyzed the impact of stricter occupational licensing requirements on the quality of outcomes and dental prices using actual dental records of consumers. Prior studies failed to examine fully the potential benefits of the licensing process, including the potential increase on both quality and quantity of service sector outputs. We modeled a demand based approach to the relationship of prevention and correction of dental deterioration. We developed a construct that helped examine the importance of personal, public, and professional intervention. This extension of current theory provided the basis for gathering the kind of data we needed to examine the relationship of licensing to consumer welfare. Next, we showed how regulation influences both the number of dentists, and the quality of a dental visit. Prices can then affect net deterioration.

Our data gathering focused on getting information that both measured the stringency of occupational licensing and outputs of dental services, and prices. Initally, we gathered data from the published pass rates obtained from the American Dental Association and from statutes governing dental licensing. We also gathered a unique data set of survey and administrative records from new recruits into the U.S. Air Force and measured outcomes in terms of the dollar value of untreated dental disease, as well as other data reflecting the national population.

Our multivariate estimates showed that increased licensing restrictiveness did not improve dental health, but did raise the prices of basic dental services. Further, using pairing techniques for tougher versus less rigorous states in terms of their licensing standards, we found that the states with the more restrictive standards provided no significantly greater benefits in terms of lower cost of untreated dental disease. Our estimates on the price equations are consistent in showing that more regulated states have higher dental prices. Consequently, overly restrictive policies that limit customer access could reduce the welfare of consumers. These results are consistent with the view that tougher licensing standards imposed by the most rigid state statutes and administrative procedures may be an unnecessary restriction on the entry of individuals with little to no benefit to the public.

These results do not provide evidence to support or refute the overall role of occupational licensing as an institution relative to a regime of, for example, certification which does not restrict occupational entry by statute. Rather our analysis is only focused on the potential costs and benefits to consumers of developing more rigid standards in states that have relatively relaxed ones. To the extent that states are considering developing more difficult standards regarding reducing the pass rate on dental exams or making it more difficult for out of state practitioners to enter, then our analysis suggests that there would be no gains to consumers in terms of better dental care. Further, our analysis applies mainly to dental care of young adult patients, although we also provide some evidence for more general quality outcomes. We therefore encourage more analysis of the type employed in this paper for other highly regulated occupations so that economists, consumers, and policy makers can more accurately assess the potential outcomes of these practices.

TABLE I
Means and Standard Deviations of Measures of Dental Quality, Individual, and State Characteristics
1992

Variable	Mean	Standard Deviation
Quality Measures (N=464)		
Total Dental Depreciation	$658	760
Dollar value of untreated correction	$223	327
Dollar value of previous treatment	$435	657
Indexed untreated correction	3.4	4.1
Indexed total correction	9.37	12.06
Price of filling	$44.84	7.17
Price of Cleaning	$76.52	15.98
Individual Characteristics (N=464)		
Percent male	82.7	37.8
Percent nonwhite	24.8	43.2
Years of education	12.7	1.99
Age	21.60	2.46
Household size	2.62	1.78
Family income	$27,842	19,398
Percent dental insurance coverage	57.9	49.5
Average dental visits (last two years)	2.63	2.55
State characteristics (N=50)		
Fluoridation rate	53.25	41.21
Average malpractice Fees (for dentist with 10 years experience)	$1,912	761
Average quality of dentists in state dental school	4.68	.39
Weighted pass rate	85.8	6.98
Endorsement statute (percent)	50.4	50
Citizenship requirement (percent)	8.18	28

TABLE II

Reduced-Form Tobit Estimates and Their Marginal Effects of the Impact of State Licensing Regulations on Untreated Dental Deterioration[1] (N=464)[2]

	DEPENDENT VARIABLE							
	Untreated Deterioration/Total Depreciation				Dollar Value of Untreated Deterioration/Total Depreciation			
INDEPENDENT VARIABLES[3]		Marginal Effects		Marginal Effects		Marginal Effects		Marginal Effects
High restrictive	---		-.03 (.08)	-.03	---	---	.02 (.08)	.01
Medium restrictive	---		-.08 (.07)	-.06	---	---	-.02 (.06)	-.01
Lesser restrictiveness of statute	-.02 (.029)	-.02	---	---	-.031 (.029)	---	---	--
Pass rate	.005 (.005)	.004	---	---	.004 (.005)	.004	---	---
Price of prevention	.0007 (.0020)	.001	.000 (.002)	.00	.000 (.001)	.00	-.002 (.005)	-.00
Price of correction	.006 (.004)	.001	.002 (.005)	.00	.005 (.004)	.004	.002 (.005)	.00
Income per family member	.002 (.002)	.000	.002 (.002)	.00	.002 (.002)	.001	.002 (.002)	.00
Education	-.032* (.012)	.001	-.03* (.01)	-.02	-.029* (.012)	-.02	-.028* (.01)	-.02
Insurance coverage	-.28* (.05)	-.16	-.27* (.05)	-.19	-.26* (.05)	-.18	-.26* (.05)	-.18
Academic ability of dentists in the state	-.034 (.072)	-.019	-.04 (.07)	-.02	.04 (.07)	.03	.02 (.07)	.02
Fluoridation	.0005 (.0005)	-.01	.0004 (.0006)	.00	.0002 (.0006)	.00	.0003 (.0005)	.00
Constant	.712 (.868)	---	1.34 (.46)	---	.35 (.87)	---	.87 (.47)	---
Log likelihood	-329.90	---	-329.85	---	-330.09	---	-330.85	---
Maximum likelihood test for joint significance of restrictiveness variables	1.54	---	1.64	---	1.72		.20	

[1]With controls for gender, race, age, childhood in military, and missing values.

[2]Standard errors are in parenthesis.

[3]Asterisk indicates significance at the .05 level.

TABLE III

Reduced-Form Estimates by Income of the Impact of State Licensing Regulations on the Dollar Value of Untreated Dental Deterioration[1]

Dependent Variables	Dollar Value of Untreated Deterioration[2]/Total Depreciation					
Independent Variables[3]	High Income N=153		Middle Income N=158		Low Income N=153	
Pass rate	.003	---	.007	---	---	.009
	(.010)		(.008)			(.009)
Lesser restrictiveness of statute	-.037	---	-.019	---	---	-.01
	(.054)		(.048)			(.04)
High restrictiveness	---	.06	---	-.05	.03	---
		(.16)		(.15)	(.14)	
Medium restrictiveness	---	.03	---	-.06	.02	---
		(.13)		(.11)	(.11)	
Price of prevention	.003	-.001	-.004	-.003	.002	.002
	(.003)	(.010)	(.003)	(.003)	(.003)	(.003)
Price of correction	-.001	.002	.007	.005	.001	.007
	(.008)	(.003)	(.007)	(.007)	(.001)	(.007)
Education	-.03	-.03	-.013	-.009	-.04	-.04*
	(.02)	(.02)	(.020)	(.023)	(.02)	(.017)
Insurance coverage	-.15	-.14	-.35*	-.29*	-.27*	-.22*
	(.12)	(.12)	(.086)	(.086)	(.08)	(.06)
Academic ability of dentists in the state	.14	.12	.029	.02	-.08	-.04
	(.14)	(.13)	(.12)	(.12)	(.11)	(.09)
Income	.004	.004	.02	.02	.02	.01
	(.003)	(.004)	(.019)	(.019)	(.02)	(.02)
Constant	-.50	-.87	-.29	.83	1.87*	2.00
	(1.58)	(.92)	(1.49)	(.79)	(.83)	(1.57)
Log-likelihood	-110.17	-108.38	-103.56	-103.83	-103.27	-102.92
Maximum likelihood test for joint significance of restrictiveness	.78	.09	.63	.21	.56	.21

[1]With controls for gender, race, age, childhood in military, fluoridation, and missing values.
[2]Standard errors are in parenthesis.
[3]Asterisk indicates significance at the .05 level.

TABLE IV

Ordinary Least Squares Estimates of the Impact of State Licensing Regulations on State Complaint Rates and Malpractice Insurance Premiums[1] (N=50)[2]

	DEPENDENT VARIABLES			
INDEPENDENT VARIABLES[3]	Complaint Rates		Log Insurance Premiums	
Restriction index of statute	.03 (.02)	---	.04 (.06)	---
Pass rate	.002 (.004)	---	-.008 (.010)	---
High regulation	---	-.02 (.07)	---	.13 (.20)
Medium regulation	---	-.06 (.06)	---	-.03 (.15)
State per capita income	-.01 (.01)	-.008 (.014)	.13* (.04)	.14* (.04)
Academic ability	.04 (.05)	.03 (.001)	-.13 (.13)	-.10 (.13)
Fluoridation	-.0002 (.0008)	-.0001 (.0008)	-.003 (.002)	-.002 (.008)
Constant	12.98 (14.13)	10.65 (14.08)	9.78 (36.98)	14.00 (36.55)
R^2	.10	.08	.30	.29
F-test for joint significance of the restrictiveness variables	1.05	.62	.64	.57

[1]Estimated with controls for state level measures of education, percent minority, average age of residence in the state, and age-squared.

[2]Standard errors are in parenthesis.

[3]Asterisk indicates significance at the .05 level.

TABLE V

Ordinary Least-Squares Estimates of the Impact of State Licensing Regulations on the Logarithm of Prices of Dental Services and Salaries[1] (N=50)[2]

	DEPENDENT VARIABLES				
INDEPENDENT VARIABLES[3]	Log Price of Filling a Cavity		Log of Weighted Price of the Most Common Procedures in the Air Force Sample		Log of Dental Salaries 1978-87
Restriction index of statute	-.008 (.020)	---	.003 (.018)	---	---
Pass rate	-.01* (.003)	---	-.01* (.002)	---	---
High regulation	---	.16* (.06)	---	.14* (.06)	.10* (.06)
Medium regulation	---	-.06 (.05)	---	-.06 (.04)	.05 (.04)
State per capita income	.04* (.01)	.05* (.01)	.05* (.01)	.05* (.01)	.02* (.01)
Academic ability	.03 (.04)	-.24 (.60)	---	.01 (.04)	.02 (.04)
Fluoridation	-.001 (.001)	-.03 (.005)	---	-.0007 (.0006)	.0005 (.0006)
Constant	-2.44 (12.05)	3.10 (11.23)	3.22 (.29)	3.00 (10.45)	47.55 (21.23)
R^2	.60	.56	.64	.68	.60
F-test for joint significance of restrictiveness variables	7.01*	11.24*	7.15*	10.47*	1.53

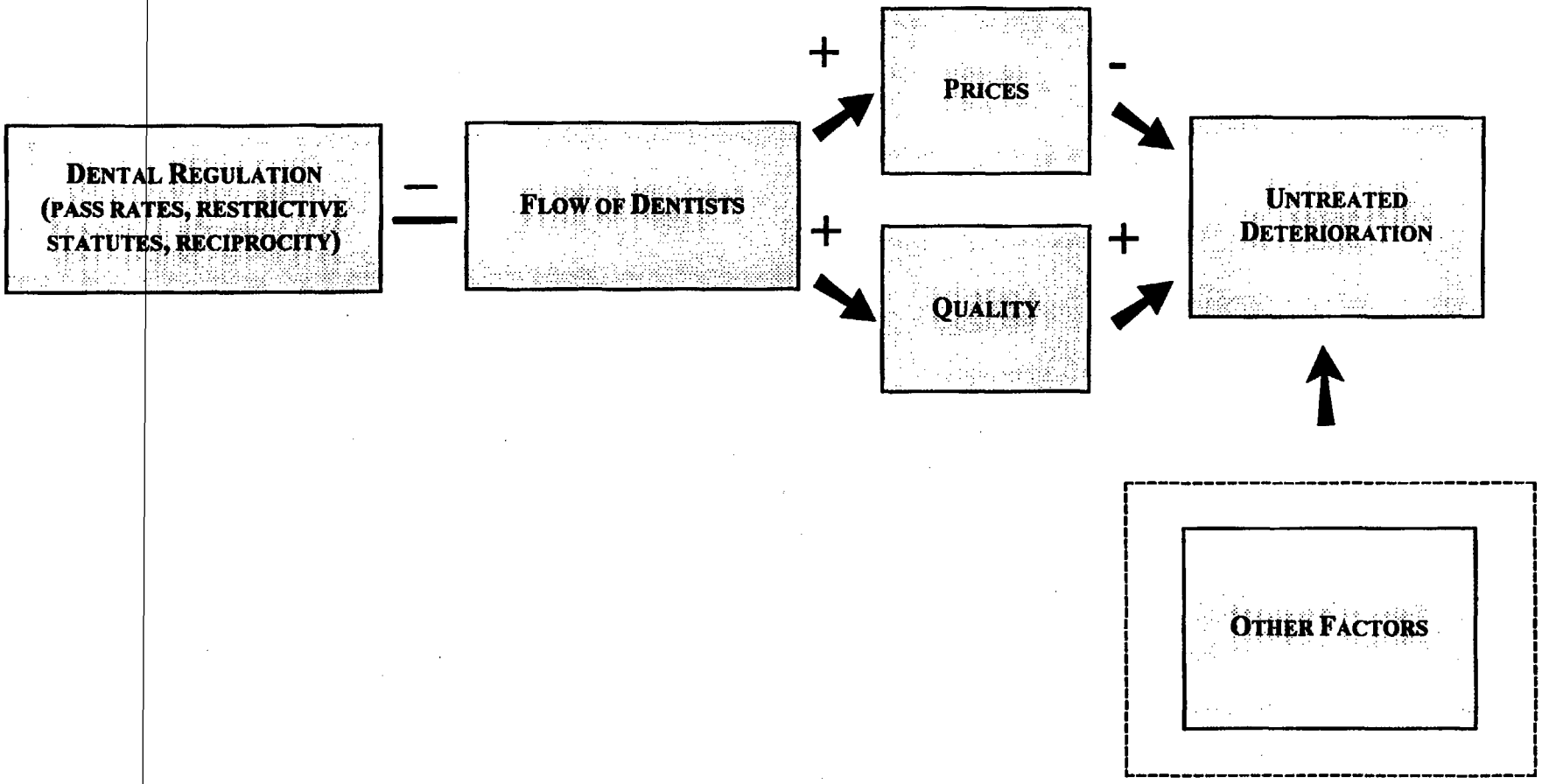
[1]Estimated with controls for state level measures of education, percent minority, average age of residence in the state, and age-squared.

[2]Standard errors are in parenthesis.

[3]Asterisk indicates significance at the .05 level.

FIGURE I

Regulation's Impact on Untreated Dental Deterioration



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ENDNOTES

1. To have comparable service flows or rates, the individuals must be the same age and otherwise similar or adjustment for such differences must be made.

2. If the rate of natural deterioration is constant over time and the efficacy of corrective interventions are not infinitely lived (which they typically are not), a constant net CR will mean a rising rate of gross CR because of the growing flow of deteriorating intervention, if one assumes that the correction deteriorates at a constant rate, i.e., where TC is total correction; GR is gross correction per period and r is the rate at which corrective interventions lose effectiveness.

$$TC_t = \sum_{i=0}^{t} GR_i(1-r)^i$$

3. The index of the investment rate in corrective services, CR, is assumed to be less than DR so that one can rule out improvements beyond a condition of "optimality" given the original structure. We assume, in order to avoid problems in these measures, that there are no contributions of purely cosmetic dentistry.

4. Unfortunately, the quality of a dental visit is an unobservable in our data set with the standard assumptions of the error term (μ, σ^2) of this factor.

5. As more dentists are available in a state, prices, including waiting time, would fall. Further, more dentists might be more effective lobbying for dental coverage in medical health plans in both the public and private sectors, thus reducing point of service money prices.

6. They also cataloged new information on the licensure of dental hygienists and dental assistants.

7. For those states that have more than one dental school, the mean value of the overall scores for new dentists was used.

8. After 1987 dental board scores were reported by region rather than state. By checking regional results and using a shift-share allocation there did not appear to be qualitative change in the pass rates to 1991. More recently, the American Association of Dental Schools have adopted as a goal a policy of eliminating all state and regional licensing exams [Meskin, 1994].

9. Since military personnels' children enlist to greater degree than the general population, we checked this issue in our sample. We found that only 27 individuals may have spent all or part of their childhood in military households.

10. Many of the examinations lacked this information, and there is a paucity of precision in this measure due to the absence of periodontal probing or the use of any of the standard periodontal

indices by the Air Force on routine dental examinations. Periodontal condition plays an important part in the dental health status of the general population, but it is less useful in a sample of very young adults since periodontal disease is not a major problem in this age group.

11. The most widely used measure of overall dental health is the DMF (i.e., the number of decayed, missing and filled teeth) [Klein, Palmer and Knutson, 1938; Knutson, Klein and Palmer, 1940]. Marcus et al., constructed a more comprehensive index of adult oral health status [Marcus, Koch and Gershen, 1980, 1983]. The present study adopts some of the elements of that index, but it does not utilize the index as it was originally constructed because all of the required data are not available from the Air Force dental examinations. The DMF is considered to have a range of 0 to 128. The mean DMF for the sample was 13.5, with a range of 0 to 35. While the mean corresponds to a rather low overall number of cavities, the range suggests a varied experience. The mean dollar amount of total previous correction is $435 (s.d. $657), while the average dollar amount to bring individuals to a disease free state is $223 (s.d. $327). All 50 states were represented in this analysis.

12. According to Dental Vital Statistics only one-third of persons under age 4 use dental services. We, therefore, also estimated our model assuming no dental care for persons of this age, and using this assumption had no qualitative impact on our basic results [Vital and Health Statistics, 1988].

13. In order to maintain consistency with Holen's analysis, we also estimate the models allocating each individual to a state, based on the last state the person lived in prior to enlistment in the Air Force. The results show no qualitatively different results than the ones shown in Tables 2 through 5.

14. It should be noted that equation (4) cannot be strictly correct. If DR is zero, then CR must be zero as well.

15. We also estimated total untreated dental depreciation with total correction as an independent variable with X_{ij} and π_{ij} and found no qualitative changes in our basic results.

16. In this model we do not include the number of visits to the dentist during the last two years since it would be potentially endogenous with untreated dental outcomes. However, we did estimate the model with this variable to control for access to dental services and to be consistent with other specifications such as those developed by Holen [1978] in her initial examination of this issue and found no qualitative differences.

17. Estimates using only those observations for which we had complete data on the covariates produced no qualitatitive differences in the results. These estimates are available from the authors.

18. We estimated the equations presented in Table 2 with 316 observations corresponding to all persons with nonzero correction and found results consistent with the estimates presented. In

addition, we estimated our reduced form Tobit with 416 observations corresponding to all persons who had nonzero deterioration during their lifetime, and found no qualitative differences relative to those shown in Table 2.

19. Additional specifications that included controls for the interaction of the licensing variables and income showed no substantial changes in the results.

20. These estimates are available from the authors upon request.

21. All of the sensitivity tests of the models estimated in Table 2 were implemented for the equations in Table 3, and the results were consistent with those shown in Table 3.

RESTRICTIONS ON DENTAL AUXILIARIES

An Economic Policy Analysis

by

J. Nellie Liang and Jonathan D. Ogur

Bureau of Economics Staff Report
to the Federal Trade Commission

May 1987

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PREFACE

This report was prepared using simple conceptual and statistical models and readily available data. The report presents new evidence on the price and income effects of restrictions on the employment of dental auxiliaries. The report also surveys the extensive literature that compares the quality of dental service by auxiliaries to the quality of service by dentists. Finally, the report draws conclusions for public policy and presents some areas for future research.

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I. Introduction and Summary

Several states impose restrictions on dentists' employment of dental auxiliaries (hygienists and assistants). For example, some states limit the number of hygienists that a dentist may employ, or the duties that an auxiliary may perform. If these restrictions prevent dentists from using auxiliaries for tasks the auxiliaries are qualified to perform, then the restrictions may reduce the efficiency of production of dental services and increase the prices that consumers pay for them. To the extent that higher prices cause consumers to decrease their purchases of dental services, the result could be a reduction in dental health.

Put another way, a potential benefit of relaxing restrictions on the use of dental auxiliaries is the extension of services to consumers who do not currently receive them (General Accounting Office, 1980, chap. 2). A 1977 survey conducted by the National Center for Health Statistics found that half of the U.S. population had not visited a dentist in a year, over one-third had not visited a dentist in two years or longer, and approximately 20 million Americans had never visited a dentist (GAO, 1980, pp. 14-15). High cost, in terms of both price and time, is a major reason why many Americans do not obtain routine dental care.[1] To the extent that relaxing auxiliary use restrictions would increase efficiency and accessibility, and lower the cost of dental care, more U.S. consumers would obtain such care.

A potential cost of relaxing restrictions on the use of dental auxiliaries is a reduction in the quality of dental service. Auxiliaries receive less extensive training than dentists do, and might be less skilled in the tasks that dentists would delegate to them.

In this report we evaluate the effects on price and service quality of a relaxation of restrictions on dentists' use of auxiliaries. Our study examines restrictions on the number of hygienists that a dentist may employ and

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[1] Two other reasons cited are fear of pain and lack of awareness of the consequences of untreated dental disease.

restrictions on the functions that an auxiliary may perform. Our study does not examine restrictions on independent practice by auxiliaries. In other words, we do not examine the requirements that auxiliaries practice under the supervision of dentists.

To evaluate the impact of auxiliary use restrictions on price, we estimate the effects of the restrictions in 1970 and 1982, the years for which state-level price data are available. Because similar restrictions were present in both 1982 and 1985 (the most recent year for which information on restrictions is readily available), our 1982 estimates provide a reasonable approximation of current price effects of the restrictions. To evaluate the effects of auxiliary use restrictions on quality, we survey an extensive literature that compares the quality of service provided by dentists to that provided by dental auxiliaries.

Our findings provide evidence that, in both 1970 and 1982, restrictions on the use of dental auxiliaries raised the prices of several dental procedures and the average price of a dental visit. According to our estimates, the individual dental-procedure price increases ranged from six to thirty percent in 1970, and from nine to ten percent in 1982. Our estimated increase in the average price of a dental visit is eleven percent for 1970, and seven percent for 1982.

These price increases imposed substantial losses on consumers and on the U.S. economy. Our estimated loss to consumers exceeds $1 billion for 1970 and is approximately $700 million for 1982.[2] We estimate that the loss to the U.S. economy was more than $500 million in 1970, and more than $300 million in 1982. Because the number of states that imposed auxiliary use restrictions in 1982 is comparable to the number in 1985, our 1982 estimates provide a reasonable approximation of current losses due to the restrictions.

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[2] Our loss estimates are expressed in 1986 dollars.

Our survey of the quality literature finds substantial agreement that, for the dental procedures studied, the quality of service provided by auxiliaries is equal to that provided by dentists. These results suggest that the substitution of auxiliary time for dentist time, which the relaxation of restrictions would permit, would not reduce the quality of dental service.

Based on the results of this and previous studies, we conclude that relaxation of restrictions on the number of hygienists that a dentist may employ would benefit consumers by providing the same quality of service at a lower price. As a result, consumers and the U.S. economy would obtain substantial savings, and increased purchases of dental care by American consumers could improve their dental health.[3] We therefore recommend that states that restrict the number of hygienists per dentist give serious consideration to relaxing those restrictions. Because our study does not examine restrictions on independent practice by dental auxiliaries, we reach no conclusions on the costs or benefits of such restrictions.

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[3] Even if the relaxation of auxiliary use restrictions provided lower quality service at a lower price, consumers might prefer that price-quality combination to the current higher-price-higher-quality combination in restricted states.

II. Dental Auxiliaries: Training and Tasks

Dental auxiliaries can be divided into three groups: hygienists, assistants, and expanded-function dental auxiliaries (EFDAs).[4] These groups differ in terms of educational requirements and the tasks that each is allowed to perform. With few exceptions, dental auxiliaries work under the supervision of a dentist.[5]

A dental hygienist must complete a two-year post-secondary-school program of instruction at a technical school, community college, or university. Then the hygienist must pass a state's licensure examination to practice in that state. The hygienist's traditional primary functions are related to the prevention of oral disease: for example, performing prophylaxes (cleanings), taking radiographs (x-rays), and giving fluoride treatments.

Most dental assistants receive their training on the job. Increasing numbers of them, however, have obtained one or two years of instruction at a vocational-technical school or community college. Although assistants are not licensed by a state, those with formal education may take an examination to be certified by the American Dental Assistants Association.

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[4] In 1977 there were approximately 110,000 dentists, 30,000 dental hygienists, 140,000 dental assistants, and 10,000 EFDAs in the U.S. (Most of the information in this section is taken from GAO, 1980, pp. 2-5.)

[5] In California, Colorado, and Washington, state dental hygienist associations are proposing that hygienists be allowed to practice independently of dentists. For example, in California, dental hygienists with five years of experience would be allowed to establish their own offices and to provide traditional hygiene services under contract with a dentist. In Washington, "dental hygienist practitioners" with a B.A. from an accredited school and two years of supervised experience would be permitted to practice independently.

The assistant's primary function is to help the dentist by, for example, preparing materials and passing instruments while the dentist treats a patient.

An EFDA is a hygienist or assistant with additional formal schooling or on-the-job training, which enables the EFDA to perform functions beyond the traditional ones of a hygienist or assistant. The education and examination requirements to become an EFDA vary by state, as do the functions that an EFDA is permitted to perform. In some states, completing restorations (fillings) is one of the EFDA's expanded functions. To complete a restoration, the EFDA places filling material (such as amalgam, composite resin, or silicate cement) in a cavity drilled by the dentist, and shapes the material to reconstruct the original outline of the tooth.

III. The Nature of the Restrictions

State restrictions on the use of dental auxiliaries take two general forms: restrictions on the number of hygienists that a dentist may employ, and restrictions on the functions that an auxiliary may perform. In some states, different functions-restrictions apply to hygienists and assistants. In addition, some state laws or regulations specify the kind of supervision that a dentist must exercise over auxiliaries' performance of different functions. The required supervision ranges from general to direct, depending upon the function. General supervision allows the dentist to authorize and instruct the auxiliary to perform certain procedures, but does not require that the dentist be present. Direct supervision requires that the dentist be present while the auxiliary performs the assigned tasks (Johnson and Holz, 1973). In either case, the supervising dentist has ultimate responsibility for the auxiliary's work.

Several states specify the maximum number of dental hygienists that a dentist may employ.[6] Further, the number of states that impose such restrictions has increased since 1970. In that year, twelve states (plus the District of Columbia) restricted the number of hygienists that a dentist was permitted to employ, with the majority of these states limiting the number of hygienists per dentist to two. In 1982, sixteen states restricted the number of hygienists, with nine states limiting the number to two. By 1985, seventeen states had such restrictions.

Until the early 1970s, many states restricted dental hygienists to the "traditional" functions of prophylaxis, applying fluoride, taking radiographs, and charting existing dental conditions (Johnson and Bernstein, 1972). As the education levels of auxiliaries increased, however, states

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[6] States that restrict the number of dental hygienists generally allow a dentist to employ between one and three hygienists. One of these states, California, limits the number of auxiliaries to two.

began to permit dental auxiliaries to take on additional responsibilities. In 1968, only nine states permitted dental auxiliaries to perform expanded functions; by 1973, 44 states allowed for expanded functions by auxiliaries.

States characterize and define expanded functions in various ways, making it difficult to distinguish clearly between restrictive and permissive states. Most state provisions, however, fall into two general categories: (1) an "open provision" which permits the dentist to delegate any function within the competence of the auxiliary; and (2) a list of specifically permitted or prohibited auxiliary functions.

Examples of the expanded functions that some states did not permit dentists to delegate to auxiliaries in 1970 are: performing preliminary oral examinations, taking radiographs, giving fluoride treatments, and completing amalgam restorations. The first three restrictions may have applied solely to dental assistants, because many states considered the restricted functions to be traditional hygienist functions. By 1982, these restrictions were virtually nonexistent for both hygienists and assistants, leaving only the restriction on completing amalgam restorations.[7]

The restriction on completing amalgam restorations was one of the most widespread restrictions on auxiliaries in both 1970 and 1982. In 1970, only five states permitted auxiliaries to complete restorations. By 1982, ten states permitted hygienists to perform this function. Also in 1982, eight states allowed dental assistants to complete amalgam restorations.[8]

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[7]Johnson and Holz (1973, p.2) note that state laws and regulations are in some instances ambiguous regarding whether particular restrictions apply to hygienists, assistants, or all auxiliaries.

[8] Based on data for earlier years, these eight states appear to be a subset of the ten that allowed hygienists to perform this function.

In the next section we will describe how state regulation of dentist licensure is relevant to our examination of auxiliary use restrictions. All states license dentists, but states differ in their treatment of dentists licensed in other states. Some states require out-of-state licensees to take an examination, while other states recognize out-of-state licenses without an examination. In 1970, 32 states required an examination of the licensees of other states. In 1982, there were 33 non-recognition states.[9]

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[9] Other state regulations may affect the organization or behavior of the dental service firm. For example, some states limit the number of offices that a dentist may have or the amount of advertising that a dentist may do. Although these regulations are beyond the scope of this study, we will examine, in Section VIII, the possible bias that their omission could cause.

IV. Some Simple Conceptual Models

The empirical work in our study is based on some simple conceptual models in which dentists are both the suppliers of some input services and the owners who receive the residual net income of the dental service firm (see Feldstein, 1973, and Saving et al., 1978). Other input services are supplied by the owners of capital and by dental auxiliaries.[10] The owner-dentists are assumed to take the prices of dental output and of these inputs as given, and to attempt to maximize net income.[11] To do this, absent restrictions on the use of inputs, dentists combine inputs so as to minimize the cost of producing any chosen level of output.

Auxiliary use restrictions can prevent dentists from achieving the most efficient combination of inputs. For example, if the optimal ratio of hygienists to dentists is three to one, then a regulation limiting the actual ratio to two to one will force dentists to deviate from the optimum. The result will be a higher cost of producing dental services and thus higher service prices.

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[10] To simplify the discussion, we ignore other input suppliers such as secretaries, receptionists, bookkeepers, and laboratory technicians. According to 1982 ADA data, 78 percent of solo dentists employed no bookkeepers, and 94 percent employed no technicians.

[11] The purpose of such simplifying assumptions is to enable us to derive empirically testable hypotheses regarding the effects of auxiliary use restrictions. Other assumptions could be made. For example, we could assume that dentists maximize a utility function in which both net income and non-monetary variables--such as location, leisure, and the quality of service--are arguments. This would imply that a dentist would be willing to sacrifice some income to practice in a desirable location, to have more leisure time, or to provide high quality service. See Conrad and Sheldon (1982) for a discussion of a dentist-utility-maximization model developed by Boulier (1979).

In addition to raising the cost of production and the price that consumers pay for dental services, auxiliary use restrictions can raise dentists' incomes. Salop, Scheffman, and Schwartz (1984) have shown that, under certain conditions, regulation of an industry will increase market price more than average cost. As a result, sellers' economic rents will increase.[12]

Higher dental service prices and dentists' incomes due to auxiliary use restrictions follow from three conceptual models of the dental service firm. In the remainder of this section, we discuss these models.[13]

In our first model, we assume that dental firms produce a single output, patient-visits. All firms are assumed to use the same technology, which combines the services of dentists, auxiliaries, and capital. Some of each of these input services is required to produce output. We further assume that if all firms in a particular location expand production, additional capital and auxiliary services can be hired at their prevailing prices. By contrast, we assume that additional dentist services are supplied only at a higher wage.

Both incumbent dentists and new-entrant dentists supply additional services only at a higher wage. An expansion of services by incumbent dentists increases the marginal value of sacrificed leisure because the incumbents must work longer hours. A higher wage is needed to induce these dentists to give up more leisure. Potential new entrants consist of

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[12] Economic rent is a payment to an input supplier in excess of the minimum income that would retain his input supply in its present use.

[13] Saving et al. (1978) develop a model in which consumer demand for dental services is influenced not only by price but also by the time required to obtain those services. In the discussion that follows, we reach similar conclusions without the time assumption.

dental school graduates[14] and dentists located outside the area of expanding dentist services. Those potential entrants with strong preferences for the expanding area enter at a relatively low wage compared to the wage needed to attract the potential entrants with strong preferences for other areas.

Regulation could contribute to the upward slope of the dentist-service supply function in some states.[15] Entry into dentist service markets appears to be impeded in states that do not recognize out-of-state dentists' licenses (see Holen, 1965; and Benham, Maurizi, and Reder, 1968). Because of the costs imposed by these states' examination requirements, a higher wage appears to be needed to induce entry by out-of-state dentists.[16]

Under these assumptions, an increase in consumer demand for patient-visits leads to a substitution of dental auxiliary and capital services for the input services supplied by dentists. As consumers' education and income rise, the demand for dental services increases, causing an increase in production. This raises the wage of dentists relative to the

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[14] According to Department of Health and Human Services' estimates based on ADA data, there were 5,337 dental school graduates in 1984 compared to 137,950 active dentists.

[15] See Feldstein (1977) and Fraundorf (1984) for histories of attempts by the ADA, its predecessor organizations, and state dental societies to restrict entry into dentistry.

[16] A policy of non-recognition in some states will affect dentists' incomes in other states. For example, if dentists' average income is relatively low in state A, the non-recognition policies of other states will impede the exit of dentists from A. As a result, dentists' average income in A could remain relatively low. To simplify the discussion, we disregard such effects.

prices of the other inputs. As a result, dentists as owners find it more efficient to produce with additional auxiliary and capital services relative to dentist services. Nevertheless, the cost of an additional patient-visit rises as production expands.

Assuming no offsetting cost reduction, the rising wage of dentists results in an upward-sloping market supply of patient-visits (S), as depicted in Figure 1. At low levels of production, the dentists' wage is relatively low, and a relatively low output price covers firms' costs including a normal return on capital. At higher levels of production, the increased dentists' wage raises costs, and a higher output price is needed to cover costs including a normal return.[17]

The market demand for patient-visits is shown in Figure 1 by curve D. Other things equal, we expect consumers to buy more patient-visits when the price falls. As a result, market demand has a negative slope (see Hu, 1981).

Given market supply S and market demand D, the equilibrium price of a patient-visit is P, and the number of patient-visits purchased is Q. Because of the upward-sloping supply of patient-visits, dentists earn rents equal to area PEA at this equilibrium.

To the extent that auxiliary use restrictions are effective, they prevent owner-dentists from minimizing costs by substituting auxiliary services for dentist services as production is expanded. As a result, the cost of patient-visits is higher at every level of output. Moreover,

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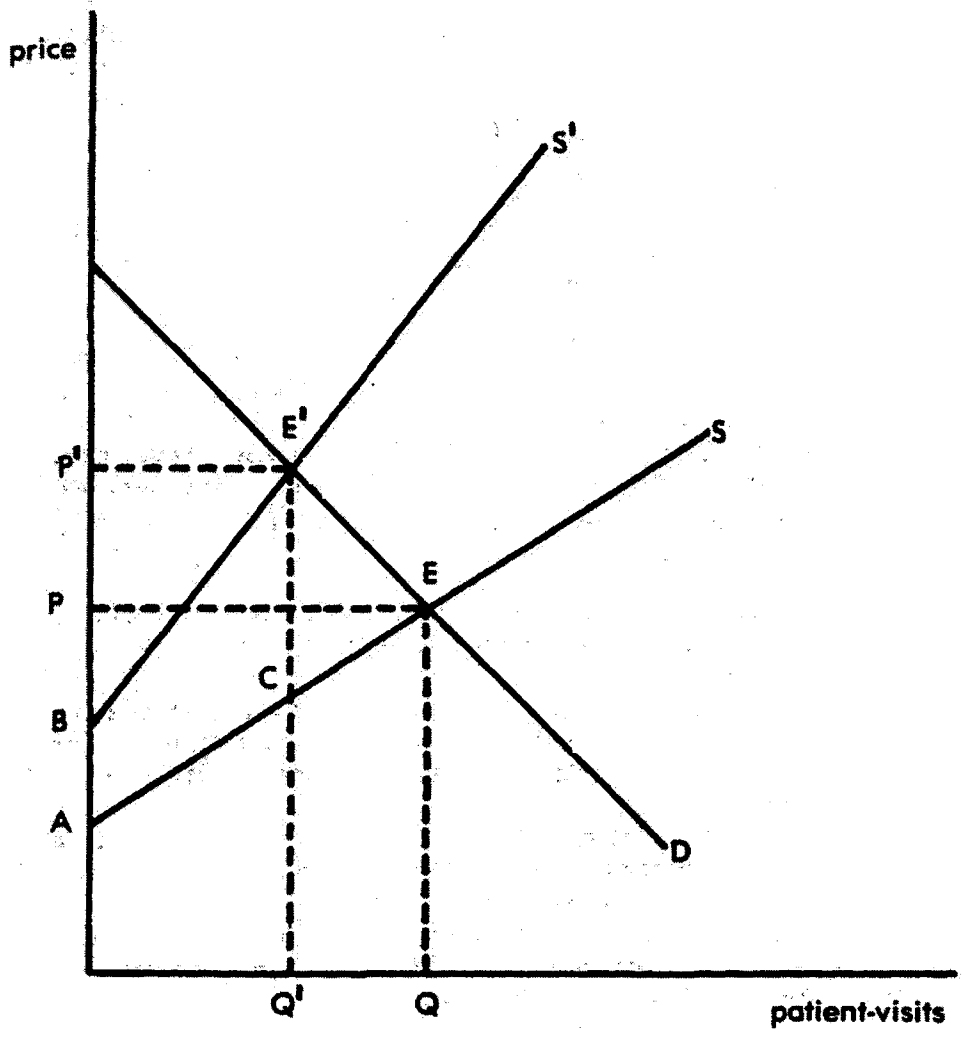
[17] Scheffman and Appelbaum (1982) suggest another reason why the market supply of patient-visits could be upward-sloping: variation in dentists' ability and productivity. For example, dentists differ in skill in performing dental procedures and in ability to manage the activities of dental auxiliaries. Given such differences, some dental firms will have higher costs than others, and the market supply of patient-visits will slope upward.

Figure 1

Supply and Demand for Patient-Visits



because regulation forces the actual auxiliary/dentist ratio to deviate farther from the cost-minimizing ratio as production expands, the cost of a patient-visit is increased more at high production levels than at low levels.[18]

The effects of auxiliary use restrictions are depicted in Figure 1 by a shift and rotation of market supply up and to the left. The market supply of patient-visits in a restricted state is shown by S', and market equilibrium is at E'. The price of a patient-visit rises to P', and the quantity of patient-visits purchased falls to Q'. The cost of the auxiliary use restriction to consumers is equal to area P'E'EP in lost consumer surplus.[19] Dentists now earn rents equal to area P'E'B which, under certain conditions (see Salop, Scheffman, and Schwartz, 1984), will be larger than area PEA, the rents earned by dentists in unrestricted markets.[20] The U.S. economy suffers a loss equal to area BE'EA. This loss is a sum of two areas: BE'CA, the additional resources needed to produce Q' patient-visits; and E'EC, the dentist rent and consumer surplus lost due to the reduction in patient-visits from Q to Q'.

In our second conceptual model, we retain all but two of the assumptions of our first model. We relax the assumption of a single output and the assumption that some of each input is needed to produce output. Instead, we assume that the dental service firm produces multiple

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[18] In Section IX, we will examine the possible effects of auxiliary use restrictions on the quality of dental services.

[19] Consumer surplus is the amount that a consumer would be willing to pay for a commodity in excess of the market price rather than doing without the commodity.

[20] Figure 1 depicts the rents earned by dentists as a group with and without auxiliary use restrictions. Because the restrictions will change the number of dentists, we cannot use Figure 1 to show the effect on rent per dentist. Nevertheless, under certain conditions, rent per dentist will increase due to auxiliary use restrictions.

outputs, such as oral examinations, prophylaxes (cleanings), radiographs (x-rays), and amalgam restorations (fillings). It is assumed that some of these outputs (for example, the taking of x-rays) can be provided by either dentists or auxiliaries without the other group's input.[21]

Under the input-supply assumptions of our first model, the supply of x-rays by dentists differs from the supply of x-rays by auxiliaries. Assuming that the supply of dentist services is upward sloping, the supply of x-rays by dentists is also upward sloping. By contrast, assuming that the supply of auxiliaries is horizontal (more auxiliaries can be employed at the prevailing wage), the supply of x-rays by auxiliaries is also horizontal.

The market for x-rays under these assumptions is depicted in Figure 2. The horizontal supply of x-rays by auxiliaries is S_a; the upward-sloping supply of x-rays by dentists is S_d. The market demand for x-rays is D. Absent auxiliary use restrictions, auxiliaries supply all x-rays in the market. Equilibrium is at E with quantity Q sold at price P. Because S_a is horizontal, no economic rents are earned. By contrast, if regulation prevents auxiliaries from supplying x-rays, then dentists provide a smaller quantity of x-rays, Q', at a higher price, P'. At the new equilibrium, E', on the dentists' supply of x-rays, S_d, dentists earn rents equal to area P'E'A. Consumer surplus falls by an amount equal to area P'E'EP. The U.S. economy suffers a loss equal to area AE'EP. This loss is a sum of two areas: AE'BP, the additional resources needed to produce Q' x-rays; and E'EB, the lost consumer surplus due to the reduction in the number of x-rays from Q to Q'.

Our third model restores our first model's assumption of a single output, patient-visits, but relaxes the assumption that all dental service firms use the same technology.

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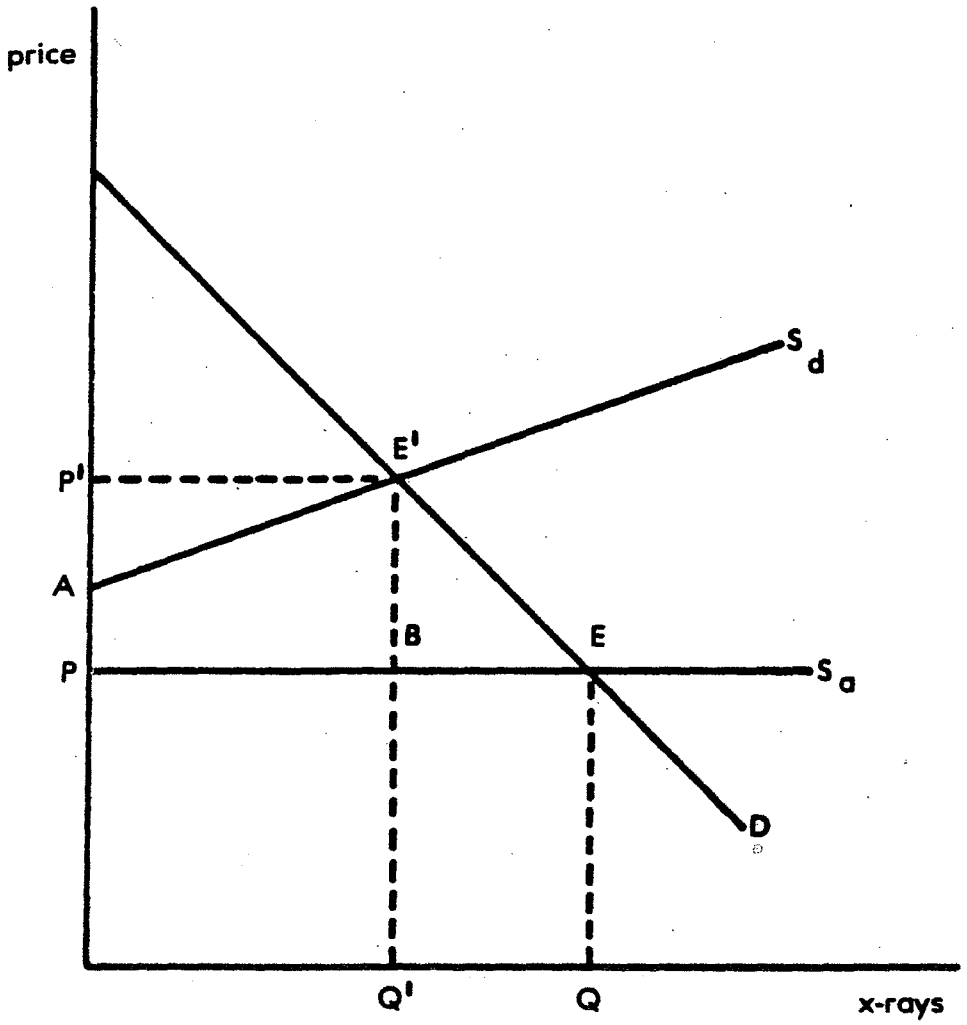
[21] Outputs that must be produced with a combination of dentist and auxiliary inputs can be analyzed using our first model.

Figure 2

Supply and Demand for X-Rays



Instead we assume that some firms (type a) use a high level of auxiliary inputs relative to dentist inputs, while other firms (type b) use few or no auxiliary inputs. This difference in input ratio can be assumed to result from differences in the ability of owner-dentists to manage the activities of auxiliaries (see Scheffman and Appelbaum, 1982).[22]

Although the supply function of each group of firms is upward sloping, the type-b supply function is steeper. Because type-b firms use dentist inputs more intensively, costs rise more rapidly when production expansion drives up the dentists' wage. As a result, a higher price of patient-visits is needed at every output to cover costs including a normal return.

Figure 3 depicts a market in which type-a and type-b firms compete. Panel 3.1 shows the supply of patient-visits

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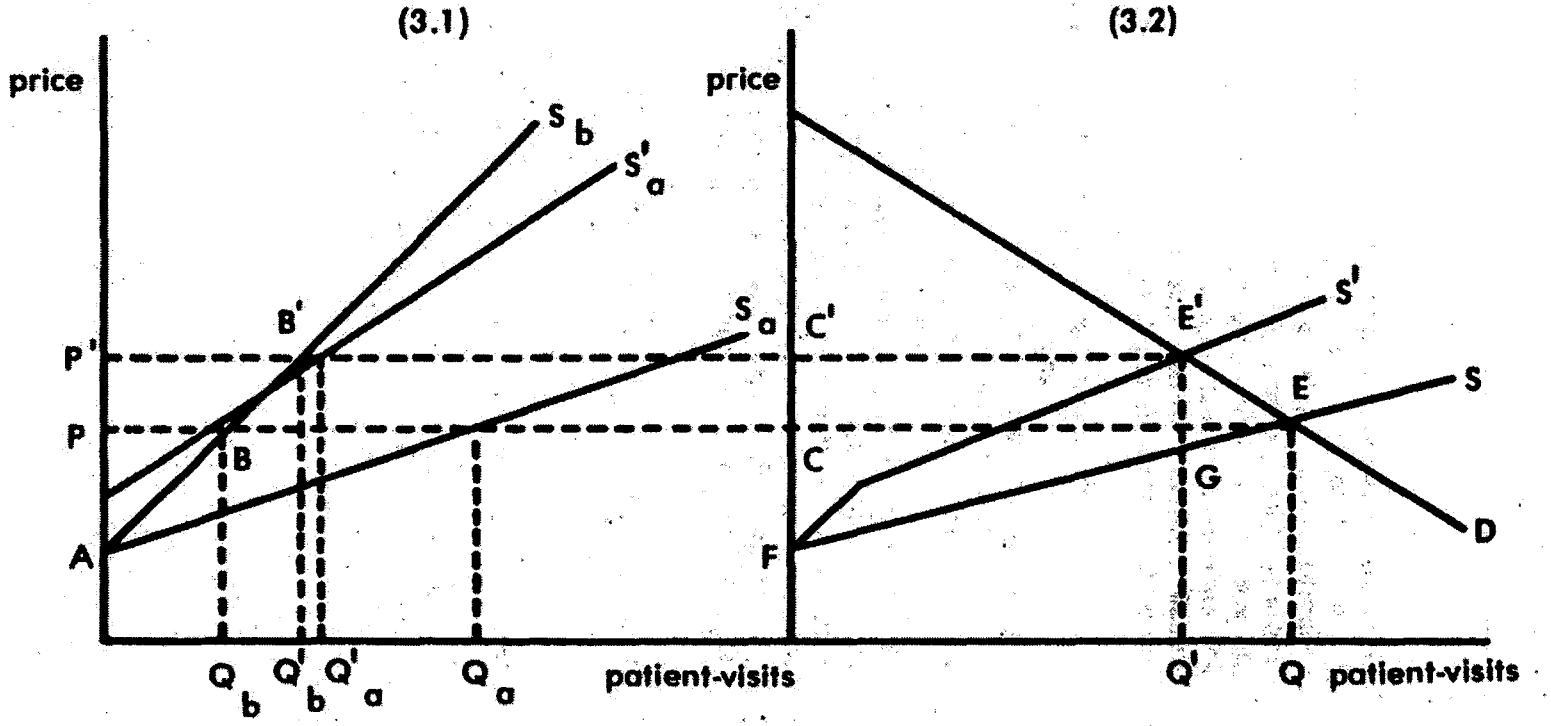
[22] Dental firms can be classified as solo practices or group practices. According to 1982 ADA data, almost 75 percent of privately practicing dentists worked as solo practitioners. Group practices with two dentists accounted for 16 percent of privately practicing dentists, and practices with three or more dentists accounted for the remaining nine percent of privately practicing dentists.

Solo practices tend to resemble our type-b firms. For 1981, ADA data indicate that 54 percent of solo dentists employed no dental hygienists, and 35 percent employed one hygienist. In that same year, 55 percent of solo dentists employed one dental assistant, and 23 percent employed two assistants.

Although we lack data on auxiliary use by group practices, ADA data for independent dentists (which include group practitioners) suggest that groups employ more auxiliaries per dentist than do solo dentists. In addition, greater use of auxiliaries by groups is asserted by Conrad and Sheldon (1982) and is implicit in Kushman et al.'s (1978) argument that group practice permits more efficient use of auxiliaries. In sum, group practices are more likely to resemble our type-a firms than are solo practices.

Figure 3

Supply and Demand for Patient-Visits by Type-a and Type-b Firms



by type-a firms, S_a, and the supply by type-b firms, S_b. Panel 3.2 shows the market supply S, which is the sum of S_a and S_b, and the market demand D. Equilibrium is at E, with price equal to P and quantity sold equal to Q. Type-b firms sell quantity Q_b and earn rents equal to area PBA. The remainder of Q, Q_a, is sold by type-a firms.

Next, assume that auxiliary use restrictions are imposed and that they affect only type-a firms.[23] The increased costs of type-a firms are represented by a shift and rotation of the type-a supply curve to S'_a. This causes the market supply to move to S'. At the new equilibrium, E', there is a higher price, P', and a lower quantity sold, Q'. The quantity sold by type-a firms falls to Q'_a. By contrast, the quantity sold by type-b firms rises to Q'_b, and the rents earned by type-b firms rise to P'B'A. As indicated in the discussion of our first model, the rents earned by type-a firms rise under certain conditions. Consumer surplus is reduced by C'E'EC. The U.S. economy suffers a loss equal to area FE'E. This loss is a sum to two areas: FE'G, the additional resources needed to produce Q' patient-visits; and E'EG, the dentist rent and consumer surplus lost due to the reduction in the number of patient-visits from Q to Q'.

In this section, we have presented three simple conceptual models which predict that auxiliary use restrictions will increase dental service prices and can increase the rents earned by at least some dental service firms. After reviewing the literature on auxiliary use restrictions in the next section, we will develop a simple econometric model to estimate the price and income effects of these restrictions. Using our econometric results, we will estimate the losses that the restrictions impose on consumers and on the U.S. economy.

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[23] Our results would follow from the weaker assumption that auxiliary use restrictions have a larger effect on type-a firms than on type-b firms. However, the exposition would be more complicated. Because type-a firms are more auxiliary-intensive, restrictions do have a larger effect on them than on type-b firms.

V. Previous Empirical Studies

Previous studies have estimated the effects of auxiliary use restrictions.[24] DeVany et al. (1982) estimated the marginal product of dentists relative to the marginal products of hygienists and assistants respectively. The authors found that restrictions on the number of hygienists employed per dentist lower the marginal product of dentists relative to that of hygienists. Restrictions on the functions that auxiliaries are permitted to perform reduce the marginal product of dentists relative to that of dental assistants. These results are consistent with the hypothesis that auxiliary use restrictions cause dental firms to deviate from optimal input proportions, using more dentist inputs relative to auxiliary inputs. The authors concluded that, as a result, auxiliary use restrictions raise dental service costs, and may increase the fees charged for those services.

The DeVany et al. paper summarizes a more extensive analysis by Saving et al. (1978), which found that dental services are produced in restrictive states using more dentist time, less auxiliary time, and less capital than in permissive states. The authors defined as permissive those states that allow the completing of amalgam restorations to be delegated to an auxiliary. Saving et al. argued that this expanded function proxies a large set of functions that are legally delegable. Using 1977 data, the authors showed that in permissive states, 70-96 percent of dental assistant functions and 89-100 percent of dental hygienist functions were legally delegable. By contrast, with some exceptions, the restrictive states did not allow more than 17 percent of the functions to

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[24] Other studies found that hiring more auxiliaries and delegating expanded functions to them increases the potential productivity of dental firms (for example, see McBride, 1975, and Lipscomb and Scheffler, 1975). For a discussion of these studies see Saving et al. (1978).

be delegated to dental assistants, or more than 42 percent to be delegated to dental hygienists.[25]

Saving et al. hypothesized that if expanded-function dental auxiliaries were being utilized in permissive states, then output per dentist and dental firm size would be larger, and fees for amalgam restorations would be lower. The study's empirical results, however, do not support these hypotheses. The authors suggested three possible explanations for these negative results: 1) it was not profitable to utilize EFDAs in permissive states, 2) auxiliary function restrictions were not enforced in restrictive states, or 3) the introduction of EFDAs was profitable in permissive states, but a long lag was required.

Conrad and Sheldon (1982) examined auxiliary use restrictions, employing a model similar to one developed by Shepard (1978)[26]. The authors' reduced-form price equation contains regulatory restrictions on: recognition of dentists licensed in other states, advertising, auxiliary functions, the number of offices per dentist, and the number of hygienists per dentist. Both an average price of a dental visit and individual dental service prices were used. For a sample of states, the authors found that restrictions on the recognition of out-of-state dentists had a significant positive effect on the average price and on the price of single extractions.

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[25] Arizona, Delaware, and Montana are the exceptions. Although classified as restrictive states because they do not permit dentists to delegate the finishing of amalgam restorations, they do permit delegation of up to 52 percent of expanded functions to dental assistants and up to 68 percent of such functions to dental hygienists.

[26] Shepard assessed the impact of licensing practices on the price of a dental visit and on the net income of dentists in 1970. The author found that, other things equal, price was 15 percent higher in states that impeded entry by out-of-state dentists. Dentists' net income was 12 percent higher in restrictive states.

the average price and on the price of single extractions. Restrictions on the number of hygienists per dentist had a significant positive effect on the price of prophylaxes. For a sample of SMSAs, restrictions on the number of hygienists and on the number of offices had significant positive effects on the average price and on the prices of prophylaxes, single extractions, and one-surface restorations. As future research, Conrad and Sheldon suggested the use of variables that represent restrictions on individual functions, instead of the summary measure that the authors used.

In sum, previous studies have presented some evidence that auxiliary use restrictions 1) distort the combination of inputs in the production of dental services, 2) raise costs, and 3) lead to higher service prices. The studies contain other evidence, however, that such restrictions have no significant effect on dental service production. These mixed findings suggest the need for more examination of the restrictions.

In the sections that follow, we will extend past work to develop a simple econometric model of auxiliary use restrictions. We will then use both 1970 and 1982 data to estimate the price and income effects of the restrictions, and the resulting losses to consumers and to the U.S. economy.

VI. A Simple Econometric Model

Building on the studies discussed in the preceding section, we estimate reduced-form price and net-income-of-dentist equations at the state level. For the price variable in our model, we use either the average price of a dental visit or the price of an individual dental service. Some individual prices are the fees for oral examinations, radiographs, prophylaxes, fluoride treatments, extractions, and amalgam restorations.

We define four expanded-functions variables which take on a value of one where a state prevents dental auxiliaries, either hygienists or assistants, from performing the following functions: preliminary oral examinations, radiographs, fluoride treatments, and amalgam restorations. These functions were chosen because each can be associated with a particular dental-service fee. In 1970 there were some restrictive states and some permissive states for each of these expanded functions. Hence, all four restrictions are included in the 1970 equations. By 1982 the first three restrictions were virtually nonexistent for both hygienists and assistants. Thus, only the restriction on completing amalgam restorations was included in the 1982 equations.

We use our model to test the hypotheses that restrictions on the number of hygienists and on the functions of auxiliaries raise dental service prices and dentists' net income. In addition to some control variables that influence the supply and demand for dental services, we include a variable to take into account the effect of dentist licensure restrictions. Assuming a linear form, the two equations of our model can be written as follows:

$$\begin{aligned}\text{PRICE} = {} & a_0 + a_1\,\text{LIMNUM} + a_2\,\text{LIMFUN} + a_3\,\text{RECOG} \\ & + a_4\,\text{SCHOOL} + a_5\,\text{FLUORID} + a_6\,\text{INCP} + a_7\,\text{AGE} \\ & + a_8\,\text{URBAN} + u\end{aligned}$$

$$\begin{aligned}\text{INCD} = {} & b_0 + b_1\,\text{LIMNUM} + b_2\,\text{LIMFUN} + b_3\,\text{RECOG} \\ & + b_4\,\text{SCHOOL} + b_5\,\text{FLUORID} + b_6\,\text{INCP} + b_7\,\text{AGE} \\ & + b_8\,\text{URBAN} + e\end{aligned}$$

All variables are defined at the state level. The price and income variables are deflated.[27]

The dependent variables are defined as follows:

PRICE = a dental service price in dollars

INCD = average net income of dentists in thousands of dollars per year

The explanatory variables are defined as follows:

LIMNUM = 1 in states that restrict the number of hygienists per dentist[28]
= 0 otherwise

LIMFUN = a vector of restrictions, as defined in dental practice acts or regulations, on the delegation of functions to auxilaries, with the following elements:

LIMEXAM = 1 in states that do not permit auxiliaries to perform oral exams
= 0 otherwise

LIMRAD = 1 in states that do not permit auxiliaries to take radiographs
= 0 otherwise

LIMFLUOR = 1 in states that do not permit auxiliaries to give fluoride treatments
= 0 otherwise

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[27] See Section VII for a discussion of the deflators that we used and for the sources of the data. The interested reader is referred to those sources for detailed definitions.

[28] One of these states, California, limits the number of auxiliaries per dentist to two.

LIMAMAL = 1 in states that do not permit auxiliaries to complete amalgam restorations
= 0 otherwise

RECOG = 1 in states that recognize dentists' licenses of another state
= 0 otherwise

SCHOOL = ratio of number of dental schools to population in thousands

FLUORID = fraction of population drinking fluoridated water

INCP = average per capita income in thousands of dollars per year

AGE = ratio of young population to total population[29]

URBAN = ratio of population living in urbanized areas to total population[30]

Predicted signs of regression coefficients and brief explanations for these predictions are as follows:

LIMNUM and LIMFUN: We expect that these restrictions will raise the cost of production of dental services and

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[29] Due to a difference in the way readily available data are tabulated, we use either population under 21 or population under 24 for the numerator of this ratio. See Section VII for more details.

[30] For a detailed definition of urban population, see U.S. Bureau of the Census, Census of Population, 1980, Appendix A.

therefore the price. These restrictions may also increase the average income of dentists.[31]

RECOG: We expect that recognition of out-of-state licenses will facilitate entry into dental services markets. This will expand the supply of dental services, tending to reduce price and dentists' average income.

SCHOOL: We expect that a higher ratio of instate dental schools to state population will facilitate entry into dental service markets, tending to lower prices and dentists' incomes.

FLUORID: Previous studies (see, for example, Hu, 1981) have found that fluoridation reduces the demand for dental services. This will tend to reduce dental service prices and dentists' incomes.

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[31] With regard to the price effects of auxiliary use restrictions, we adopt what appears to be the most general hypothesis, namely that such a restriction will increase the prices of all dental services, but that the effect will be strongest on the price of the service that is directly limited. For example, we hypothesize that a restriction preventing auxiliaries from completing amalgam restorations will also affect the prices of oral examinations, radiographs, prophylaxes, fluoride treatments, and extractions, but that the restriction will have the strongest effect on the price of amalgam restorations.

Saving et al. (1978) adopted a similar hypothesis. The authors argued that if using an auxiliary in place of a dentist is economically efficient, then legislation allowing the auxiliary to perform a function will lower the price of that function. The dentist can then reallocate his time to other dental services, but because his labor will be spread across many other services, the effect on the prices of these services will be smaller.

INCP: We expect that consumers with higher incomes will demand more dental services. Given an upward sloping supply of dental services, an increase in demand will raise price and tend to increase dentists' incomes.

AGE: Previous studies (see, for example, Hu, 1981) have found that the demand for dental services for children is greater than the demand for dental services for adults. Where children are a relatively large fraction of the population, we expect dental service prices and dentists' income to be higher.

URBAN: We expect input prices (for example, land) to be higher in urbanized areas. This will tend to increase the cost of production and the price of dental services, and will reduce dentists' incomes, other things equal.

VII. The Data

Because no consistent, multiyear data set is readily available, we develop state-level price data from two different sources, one for 1970 and another for 1982. American Dental Association price data for the 1970 estimations are available from the ADA's 1970 Dental Fee Survey and from Shepard (1978). The 1970 Dental Fee Survey reports fees for individual dental services. Shepard constructed an average price of a dental visit by weighting twelve of the ADA fees by the frequency with which each service is performed; the weights are provided by Poetsch and Moen (1969).[32] We examine some of the services that Shepard included in his study, but we put greater emphasis on relatively auxiliary-intensive services.[33]

Although no ADA price data are available at the state level for later years, 1982 data on expenditures and number of charges by dental service are available at the zip code level from Health Insurance Association of America, Prevailing Dental Healthcare Charges. For each dental service, we aggregated these data to the state level and divided total expenditures by the total number of charges to

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[32] The services included in Shepard's average are periodic oral exam, complete series of x-rays, dental prophylaxis, simple tooth removal, root canal extirpation and filling, amalgam filling (one surface), amalgam filling (two surfaces), gold inlay (two surfaces), cast gold crown, bridge (two units), acrylic-base denture, and denture repair.

[33] The ten services that we examine for 1970 are periodic oral examination (excluding radiograph), complete series of bitewing radiographs, dental prophylaxis, topical application of stannous fluoride (one treatment excluding prophylaxis), simple removal of tooth (with local anesthesia and including routine postoperative care), extirpation of pulp and filling of one root canal (excluding restoration), amalgam filling for one-surface cavity, amalgam filling for two-surface cavity, gold inlay for two-surface cavity, and cast gold crown (all cast).

obtain the average price of the service. We then constructed an average price of a dental visit by weighting thirteen of these individual dental-service prices by the services' respective shares of the total number of charges for all thirteen services.[34] The services included in our 1982 average differ from our 1970 services and from the services included in Shepard's 1970 average.[35] The differences are due to variation in the availability and aggregation of the reported prices.[36]

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[34] Our 1982 average price is deflated by 1980 Bureau of Labor Statistics budget data for an intermediate income, four-person family. A similar deflator was used by Conrad and Sheldon (1982). By contrast, Shepard's 1970 average price is deflated by the 1970 BLS Consumer Price Index. Conrad and Sheldon concluded that this and other differences between their data and Shepard's did not lead to a large difference in the estimated effect of reciprocal licensing of out-of-state dentists.

[35] The services that we include in our 1982 average are periodic oral examination, bitewings (two films), prophylaxis (adults), prophylaxis (children), topical application of stannous fluoride (one including prophylaxis), amalgam (one surface, deciduous), amalgam (two surfaces, deciduous), amalgam (one surface, permanent), amalgam (two surfaces, permanent), inlay (gold, two surfaces), gold full cast crown, root canal therapy (one excluding restoration, traditional), and extraction (single tooth).

[36] Two of Shepard's twelve procedures--bridge and denture--were not included in our 1982 average because HIAA data on expenditures and number of charges were not available for all states, and because these procedures appear to use small quantities of auxiliary inputs. In addition, because the HIAA data disaggregate prophylaxes into adult's and children's services, and amalgam fillings into those for deciduous and permanent teeth, we included the disaggregated service prices in our 1982 average price.

The values of the restrictions variables are presented in Tables 1 and 2. The auxiliary-use restrictions variables are defined taking into account both laws and regulations. Restrictions on the number of hygienists are reported by DeVany et al. (1982). The restrictions on auxiliary functions are reported in the ADA Survey of Practice Act Provisions for Expanded Functions, 1972. For 1982, limits on the number of hygienists and restrictions on hygienist functions are reported in the American Dental Hygienists' Association's Legislative Action Package, Comparative Overview of 51 Practice Acts. Restrictions on the recognition of out-of-state dentists' licenses are presented in Johnson and Bernstein (1972) and in "Licensure by Credentials," (1985).

State-level data for the remaining variables were obtained from several sources. Net income of dentists by state for 1970 is reported in the ADA's 1971 Survey of Dental Practice. The number of dental schools is available from the ADA's Annual Report on Dental Education, various issues. Urbanization, income per capita, population, and age variables are available from the Statistical Abstract.[37] The percentage of the population drinking fluoridated water is reported in the Fluoridation Census, 1970 and 1980.

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[37] Due to a change in the way readily available data are tabulated, a difference exists between the 1970 and 1982 definitions of the AGE variable. In 1970, AGE is the fraction of the population under 21; in 1982, it is the fraction under 24.

TABLE 1
State Restrictions, 1970

States	RECOG	LIMNUM	LIMEXAM	LIMRAD	LIMFLUOR	LIMAMAL
Alabama	0	0	1	1	1	1
Alaska	1	0	1	1	1	1
Arizona	0	0	1	1	1	1
Arkansas	0	0	1	0	1	1
California	0	1	1	1	1	1
Colorado	0	0	1	1	1	1
Connecticut	0	0	0	0	0	1
Delaware	0	0	1	0	1	1
D.C.	0	1	1	1	1	1
Florida	0	1	1	0	1	1
Georgia	0	0	0	0	1	1
Hawaii	0	0	1	1	1	1
Idaho	0	0	0	0	0	1
Illinois	1	1	1	1	1	1
Indiana	1	0	1	1	1	1
Iowa	1	0	0	0	0	1
Kansas	1	0	1	1	1	1
Kentucky	1	1	0	0	0	0
Louisiana	0	0	0	0	0	1
Maine	0	0	0	0	0	0
Maryland	0	0	1	0	0	1
Massachusetts	1	0	1	1	1	1
Michigan	0	0	1	0	1	1
Minnesota	0	0	0	0	0	1
Mississippi	1	0	1	0	0	1
Missouri	1	0	1	0	0	1
Montana	0	0	1	1	1	1
Nebraska	1	0	0	0	1	1
Nevada	0	0	1	1	1	1
N. Hampshire	1	0	1	0	0	1
N. Jersey	0	0	1	1	1	1
N. Mexico	0	1	1	1	1	1

N. York	1	0	0	0	1	1
N. Carolina	0	1	0	0	0	1
N. Dakota	1	0	1	0	1	1
Ohio	1	1	1	0	1	1
Oklahoma	1	1	1	0	0	1
Oregon	0	1	0	0	0	0
Pennsylvania	1	0	1	0	0	0
Rhode Island	1	0	1	1	1	1
S. Carolina	0	0	0	0	0	1
S. Dakota	1	0	1	0	0	1
Tennessee	0	0	0	0	0	1
Texas	0	1	0	0	0	1
Utah	0	0	1	1	1	1
Vermont	0	0	1	1	1	1
Virginia	0	1	1	1	1	1
Washington	0	1	0	0	0	0
W. Virginia	1	0	1	1	1	1
Wisconsin	0	0	1	1	1	1
Wyoming	0	0	1	0	0	1
Total	19	13	35	21	29	46

RECOG = 1 in states that recognize other states' dentists' licenses.

LIMNUM = 1 in states that restrict the number of hygienists per dentist.

LIMEXAM = 1 in states that do not permit auxiliaries to perform preliminary oral examinations.

LIMRAD = 1 in states that do not permit auxiliaries to take and expose radiographs.

LIMFLUOR = 1 in states that do not permit auxiliaries to apply fluoride.

LIMAMAL = 1 in states that do not permit auxiliaries to complete amalgam restorations.

TABLE 2.
State Restrictions, 1982*

States	RECOG	LIMNUM	LIMAMAL
Alabama	0	0	1
Alaska	0	0	0
Arizona	0	1	1
Arkansas	1	0	1
California	0	1	1
Colorado	0	1	0
Connecticut	0	0	1
Delaware	0	0	1
D.C.	0	0	1
Florida	0	1	1
Georgia	0	0	1
Hawaii	0	0	1
Idaho	0	0	1
Illinois	0	1	1
Indiana	1	0	0
Iowa	1	0	1
Kansas	1	0	1
Kentucky	0	1	0
Louisiana	0	0	1
Maine	1	0	1
Maryland	1	0	1
Massachusetts	1	0	1
Michigan	1	0	1
Minnesota	1	0	1
Mississippi	0	0	0
Missouri	1	0	1
Montana	0	1	1
Nebraska	1	0	1
Nevada	0	0	1
N. Hampshire	1	0	1
N. Jersey	0	0	1
N. Mexico	0	1	1
N. York	1	0	1
N. Carolina	0	1	1
N. Dakota	0	0	1
Ohio	0	1	0

Oklahoma	1	1	1
Oregon	0	1	1
Pennsylvania	1	0	0
Rhode Island	1	0	1
S. Carolina	0	0	1
S. Dakota	0	0	1
Tennessee	1	0	1
Texas	0	1	1
Utah	0	1	1
Vermont	1	0	0
Virginia	0	1	1
Washington	0	1	0
W. Virginia	0	0	1
Wisconsin	0	0	1
Wyoming	0	0	0
Total	18	16	41

RECOG = 1 in states that recognize other states' dentists' licenses.

LIMNUM = 1 in states that restrict the number of hygienists per dentist.

LIMAMAL = 1 in states that do not permit auxiliaries to complete amalgam restorations.

*Restrictions on performing oral exams, taking radiographs, and applying fluoride were virtually nonexistent by 1982.

VIII. Estimation Results

Our price equations were estimated by the ordinary-least-squares technique (OLS) for 1970 and 1982. Because data are not available for later years, the dentist income equation was estimated by OLS only for 1970. The results are summarized in Tables 3 and 4 and discussed in the accompanying text (see also the more detailed tables in the Appendix). [38]

A. 1970 Estimation Results

1. Price of a dental visit

The average 1970 price of a dental visit is higher in states that restrict the number of hygienists per dentist, or that do not permit auxiliaries to complete amalgam restorations. In states that restrict the number of hygienists per dentist, the average price is five percent higher than the mean 1970 average price. In states that do not permit auxiliaries to complete amalgam restorations, the average price is six percent higher than the mean.[39]

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[38] In general, in both the text and tables, we report results that are statistically significant at a conventional level, the five percent level.

[39] States that recognize dental licenses from other states have average prices that are four percent lower than the mean price. This result is consistent with our prediction that non-recognition impedes entry, and with the findings of previous studies (see Shepard, 1978, and Conrad and Sheldon, 1982).

The signs of several other significant coefficients are consistent with predictions. The positive coefficient of the urbanization variable is consistent with the hypothesis that urban areas have higher factor prices. The positive per capita income coefficient supports the proposition that high income increases the demand for dental services. The negative fluoridation coefficient is consistent with the

(continued...)

TABLE 3.

Summary of Percentage Effects of Auxiliary Use Restriction, 1970

Dependent Variable	Restriction LIMNUM	LIMEXAM	LIMRAD	LIMFLUOR	LIMAMAL
Price of...					
Patient Visit	5	n.s.*	n.s.	n.s.	6
Oral Exam	11	n.s.	n.s.	n.s.	19
Radiograph	n.s.	n.s.	n.s.	n.s.	8
Prophylaxis	11	n.s.	n.s.	n.s.	n.s.
Fluoride Treatment	7	n.s.	n.s.	n.s.	n.s.
Extraction	5	n.s.	n.s.	n.s.	7
Root Canal	7	n.s.	n.s.	n.s.	11
Amalgam Restoration (1 surface)	9	n.s.	n.s.	n.s.	n.s.
Amalgam Restoration (2 surfaces)	6	n.s.	n.s.	n.s.	n.s.
Gold Inlay	n.s.	n.s.	n.s.	n.s.	n.s.
Gold Crown	n.s.	n.s.	n.s.	n.s.	n.s.
Dentists' Income	6	n.s.	n.s.	n.s.	10

* n.s. = not significant at five percent level.

Allowing auxiliaries to perform radiographs, fluoride treatments, or preliminary oral exams has no significant effect on the average price. As we explained in Section III, these restrictions may have appled solely to dental assistants; hygienists have traditionally been able to perform these functions. To the extent that hygienists can substitute for assistants, these restrictions will have smaller impacts on costs and prices. Our results are consistent with the proposition that hygienists are a good substitute for assistants in the performance of these functions.

Auxiliary use restrictions could be correlated with other restrictions on dental practice, such as restrictions on advertising by dentists and on the number of offices that a dentist may operate. If such correlation existed, then our auxiliary-use-restrictions results would be biased. To test this possibility, we estimated a model that includes restrictions on advertising and on the number of offices per dentist. The coefficients of these added restrictions are insignificant. In addition, the coefficients of the auxiliary use restrictions are essentially unchanged. Based on these findings, we conclude that our auxiliary-use-restrictions results are not biased by the omission of other dental-practice restrictions.[40]

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[39](...continued)
hypothesis that fluoridation decreases the demand for dental services. Our fluoridation result is also consistent with the findings of several earlier studies (see for example, Shepard, 1978, and Hu, 1981). Finally the significant coefficients of the two demand variables (per capita income and fluoridation) provide support for our hypothesis that the supply of dental services is upward sloping.

The SCHOOL and AGE variables' coefficients are not significant. A similar result was obtained using the ratio of new dental graduates to population in place of the ratio of dental schools to population.

[40]The estimation of this expanded model should not be viewed as a definitive test of hypotheses regarding the (continued...)

2. Individual service prices

Individual price equations were also estimated to isolate the dental services whose prices were affected by auxiliary restrictions in 1970. Several coefficients have the expected signs.

Limiting the number of hygienists per dentist raises the prices of seven of the ten procedures studied. These seven are: oral exam, prophylaxis, fluoride treatment, extraction, root canal therapy, and one- and two-surface amalgam restorations. The price increases for these seven procedures range from five to eleven percent.

The prices of four of the ten procedures are significantly higher in states that do not allow auxiliaries to complete amalgam restorations. These four procedures are: oral exam, radiograph, extraction, and root canal therapy. The price increases for these four procedures range from seven to nineteen percent. These results are inconsistent with the hypothesis that the restriction on completing amalgam restorations will raise the price of a restoration more than the prices of other dental services.

Consistent with our average price results, the remaining auxiliary-use restrictions do not have significant positive coefficients. As suggested above, these restrictions may limit the use only of dental assistants. Hence, our individual service results tend to provide added support for

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[40](...continued)
impact of restrictions on either advertising by dentists or the number of offices per dentist. The data for these restrictions were selected primarily because of their ready availability in Conrad and Sheldon (1982). The data do suggest that there was little interstate variation in advertising restrictions in 1970 (Conrad and Sheldon, 1982, pp. 53-54). A definitive test of hypotheses regarding advertising and number-of-office restrictions would require more careful selection of data, and is beyond the scope of this study.

the proposition that hygienists are good substitutes for assistants.[41]

In sum, our 1970 price-equation results provide evidence that auxiliary restrictions increase the prices of some dental procedures and the average price of a dental visit. These findings are consistent with the hypothesis that the restrictions force dentists to adopt input combinations that increase the costs of dental service firms.

3. Net Income of Dentists

Having estimated the effect of auxiliary use restrictions on price, we now test the hypothesis that they increase the net income of dentists, a possibility suggested by Salop, Scheffman, and Schwartz (1984). For 1970, we find that dentists' net income is higher in states that restrict the number of hygienists per dentist or that do not allow auxiliaries to complete amalgam restorations. Where hygienists' numbers are limited, the net income of dentists is six percent higher than the mean net income of dentists. Where auxiliaries are not permitted to complete amalgam restorations, dentists' income is ten percent higher than the mean.

It is of interest to note that the income-raising amalgam-restoration restriction has persisted over time. In 40 of the 45 states for which we have complete data, auxiliaries were not permitted to finish amalgam restorations in 1970, and 38 of 47 such states did not allow dentists to delegate this function in 1982. By contrast, the other

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[41] Recognition of out-of-state dentists' licenses lowers the price of two of the ten procedures. These decreases range from five to six percent. With the exception of the SCHOOL variable (whose coefficient is never significant), the coefficients of the other explanatory variables are significant in some of the price equations.

auxiliary-use restrictions were virtually non-existent in 1982.[42]

B. 1982 Estimation Results

It is important to recall that the restrictions on oral exams, radiographs, and fluoride treatments were virtually nonexistent for both hygienists and assistants in 1982. As a result, only the restriction on completing amalgam restorations is included in the 1982 equations. As we explained in Section V, this restriction is correlated with a large number of restrictions on the functions that could be delegated to auxiliaries, which were omitted from our 1970 equations. Between 1970 and 1982, it appears that the states relaxed many of these omitted restrictions. As a result, the amalgam restoration restriction probably represents significantly fewer such restrictions in the 1982 equations.

1. Price of a dental visit

Consistent with our findings for 1970, the restriction on the number of hygienists per dentist has a significant positive effect on the 1982 average price of a dental visit.

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[42] For example, comparing the 1970 sample of states for which we have complete data to the 1982 sample, the number of states that restricted the taking of x-rays declined from 18 to zero. In 1982, only the District of Columbia imposed this restriction, and only on dental assistants.

The net income of dentists is influenced significantly by two other variables: recognition of out-of-state licensees and per capita income. Dentists in recognition states have net incomes that are seven percent below the mean. This result is consistent with the hypothesis that non-recognition impedes entry by out-of-state dentists. In addition, dentists' incomes are higher in states with high per capita incomes. This is consistent with the predicted effect of per capital income on the demand for dental services. The remaining auxiliary-use restrictions and the SCHOOL, AGE, and URBAN variables have insignificant coefficients.

TABLE 4.

Summary of Percentage Effects of Auxiliary Use Restrictions, 1982

Dependent Variable	Restriction	
	LIMNUM	LIMAMAL
Price of...		
Patient Visit	7	n.s.*
Oral Exam	n.s.	n.s.
Radiograph	n.s.	n.s.
Prophylaxis (Adults)	10	n.s.
Prophylaxis (Children)	n.s.	n.s.
Fluoride Treatment	n.s.	n.s.
Amalgam Restoration (1 surface, deciduous)	n.s.	n.s.
Amalgam Restoration (2 surfaces, deciduous)	9	n.s.
Amalgam Restoration (1 surface, permanent)	10	n.s.
Amalgam Restoration (2 surfaces permanent)	10	n.s.

TABLE 4.--Continued

Dependent Variable	Restriction LIMNUM	LIMAMAL
Gold Inlay	10	n.s.
Gold Crown	n.s.	n.s.
Root Canal	n.s.	n.s.
Extraction	n.s.	n.s.

* n.s. = not significant at five percent level.

Price is seven percent higher in states that impose this restriction than the mean price of a dental visit. By contrast, the amalgam restoration restriction does not have a significant positive effect on average price in 1982.[43]

2. Individual service prices

In states that restrict the number of hygienists per dentist, the prices of five of our thirteen procedures are higher than in states that do not impose these restrictions. These five procedures are: adult prophylaxis, amalgam restoration (two surface, deciduous), amalgam restorations (one and two surface, permanent), and two-surface gold inlay. The price increases range from nine to ten percent, evaluated at the mean price for each procedure.[44]

In some states, limits on the number of hygienists appear to be reinforced by other restrictions that prevent dental assistants from performing traditional hygienist functions. For example, in 1982, 32 states did not permit dental assistants to clean and polish teeth. In states that also limited the number of hygienists, dentists could not substitute assistants for hygienists to provide prophylaxes.

Restricting auxiliaries from completing amalgam restorations has no significant effect on any of the 1982

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[43] Similarly, recognition of out-of-state dentists' licenses does not have a significant price-reducing effect in 1982. However, income per capita and the percentage of the population drinking fluoridated water do have significant effects on price. The coefficients of these two demand variables have the same signs as in the 1970 equations: positive for per capita income and negative for the percentage of the population drinking fluoridated water. The SCHOOL, AGE, and URBAN variables do not have significant effects on average price.

[44] In the 1982 individual-price equations, recognition of out-of-state dentists' licenses lowers the price only of oral examinations.

individual prices that were examined. These results contrast with the four significant amalgam-restoration coefficients for 1970. Perhaps the simplest explanation for this contrast, as suggested by Saving et al. (1978), is that the amalgam restoration restriction is a proxy for a large set of auxiliary function restrictions, and that most of the other members of that set were eliminated in the interim.

Alternatively, the finding that the restriction on amalgam restorations does not raise prices in 1982 may be the result of differences in the price data. ADA survey data were used for 1970, but HIAA insurance data were used for 1982. An uncertainty associated with the use of insurance data is whether a patient with insurance tends to pay higher prices than one with no insurance. In addition, to the extent that there is heterogeneity within a procedure category, and insurance coverage is selective, a price based on insurance data will differ from a price based on data that more broadly represent the range of services within the procedure category. As a result, any bias present in the 1982 insurance data may be greater than any bias in the ADA data.

Despite the different data sets used, however, our empirical results for 1970 and 1982 provide evidence that auxiliary use restrictions raise the prices of several dental procedures and the average price of a dental visit. Such price increases could impose substantial losses on consumers and on the U.S. economy. In the remainder of this section, we estimate these losses.

C. Loss Estimates

Using our regression results, we can estimate the losses that auxiliary use restrictions imposed on consumers and on the U.S. economy in 1970 and 1982. The losses are depicted

in Figure 4, which is similar to Figure 1. Both figures are drawn based on the assumptions of our first model.[45]

1. Consumer surplus loss

Auxiliary use restrictions reduce consumer surplus by an amount equal to area P'E'EP in Figure 4. To estimate this loss, we derived an algebraic expression for area P'E'EP in terms of the percentage change in the price of a patient-visit due to the restrictions, total expenditure on patient-visits, and the price elasticity of demand for patient-visits.[46] Values of these variables were obtained using our estimated regression coefficients, estimates that we made of expenditures,[47] and estimates of demand elasticity

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[45] This model assumes that dental firms produce a single output, patient-visits. The model is discussed in Section IV; the results of estimating the model are presented in Tables A-1 and A-13.

[46] Assuming a non-unitary constant-elasticity demand function to simplify the mathematics, it can be shown using the integral calculus that the loss in consumer surplus is equal to the following expression.

$$[E/(1-e)][1-p)^{(1-e)}]$$

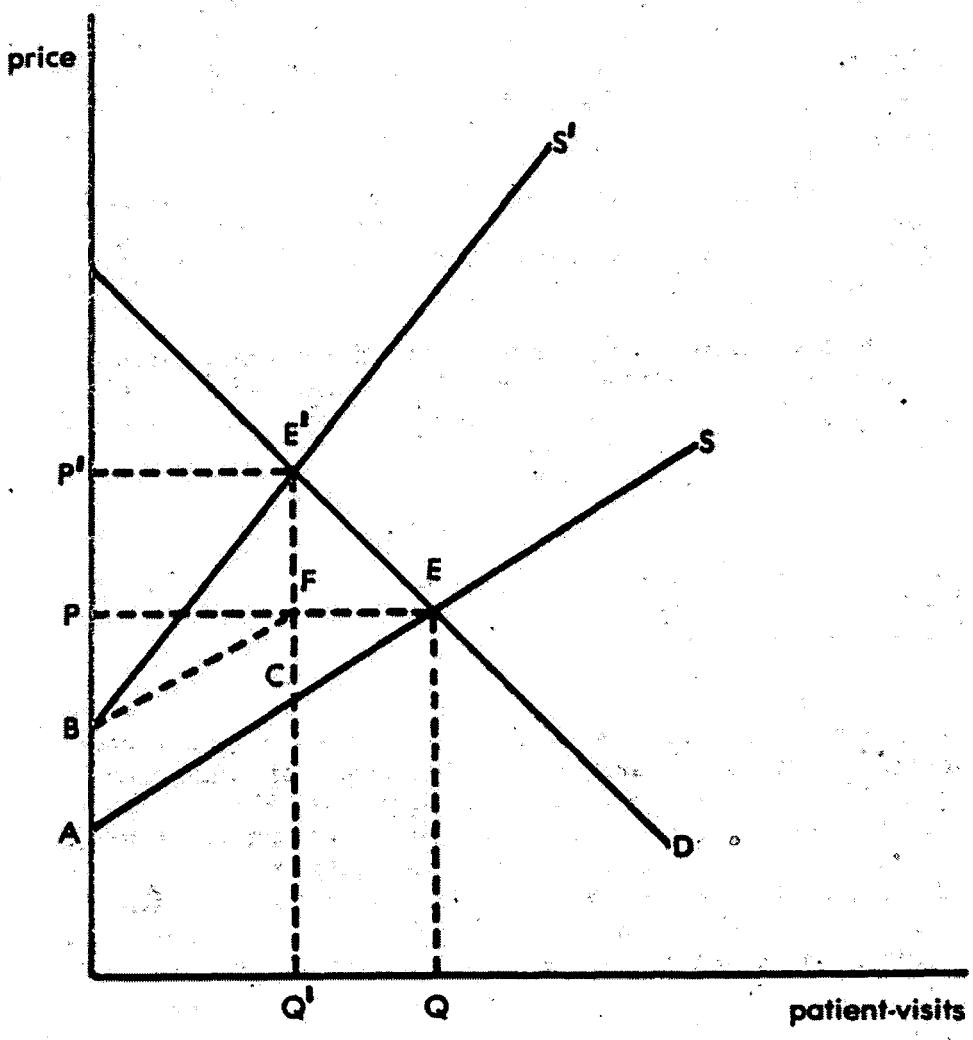
where E=total expenditure, e=elasticity of demand, and p=percentage decrease in price due to the relaxation of auxiliary use restrictions.

[47] For 1970, we estimated expenditure per dentist by state from ADA data on mean gross income of independent dentists. Lacking data on the number of independent dentists by state, we used an aggregate U.S. ratio of independent to active civilian dentists to convert the number of active civilian dentists in each state (obtained from HHS data) to an estimate of the number of independent dentists in the state. We then multiplied our number-of-dentists estimate by mean gross income to obtain estimated dental

(continued...)

Figure 4

Supply and Demand for Patient-Visits



that we obtained from the literature.[48] Using different values of the elasticity, we constructed a range of loss estimates.[49]

For the year 1970, we estimate that restrictions on the number of hygienists per dentist reduced consumer surplus by $280-290 million in the 12 states that imposed such restrictions. We also estimate that restrictions on finishing amalgam restorations reduced consumer surplus by $790-840 million in the 40 states that imposed such restrictions. In total, we estimate that auxiliary use restrictions imposed a loss of $1.07-1.13 billion on consumers during the year 1970.[50]

For the year 1982, we estimate that restrictions on the number of hygienists per dentist reduced consumer surplus by $680-710 million in the 16 states that imposed such restrictions. Because we observed no significant effect of restrictions on the finishing of amalgam restorations for 1982, $680-710 million is also our estimate of the total loss imposed on consumers by auxiliary use restrictions in that year.

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[47](...continued)
expenditures by state. For 1982, Health Care Financing Administration data on dental expenditures by state are presented in Levit (1985, pp. 44-45).

[48] The range of demand elasticity estimates obtained in previous studies (0.03 to 1.76) was found in Hu (1981).

[49] Because we estimated the percentage change in the price of a patient-visit using the restricted price as the base (P' in Figure 4), our loss estimates vary positively with the elasticity of demand.

[50] Our loss estimates are expressed in 1986 dollars for purposes of comparison. Estimates of the total loss may differ from the sum of the individual loss estimates due to rounding errors.

2. Loss to the U.S. economy

Auxiliary use restrictions cost the U.S. economy an amount equal to area BE'EA in Figure 4.[51] Lacking estimates of the effects of the restrictions on the supply curve for patient-visits, we cannot obtain a direct estimate of this loss. We can, however, estimate the loss indirectly using its relationship to the consumer surplus loss. A conservative lower-bound estimate of the loss to the U.S. economy is one-half of the loss in consumer surplus.[52] For 1970, we estimate that auxiliary use restrictions imposed a loss of $540-560 million on the U.S. economy. For 1982, our estimate of this loss is $340-360 million.[53]

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[51] The loss to the U.S. economy will be smaller than the loss to consumers if the restrictions transfer income from consumers to dentists.

[52] In Figure 4, it can be seen that area BE'EF is smaller than the loss to the U.S. economy, area BE'EA. To compare area BE'EF to the loss in consumer surplus, area P'E'EP, we can subtract the area common to both, E'EF. What remains is rectangle P'E'FP and triangle BE'F. It follows from elementary geometry that the area of BE'F is one-half of the area of P'E'FP. Hence, one-half the consumer surplus loss is a conservative lower-bound estimate of the loss to the U.S. economy.

[53] The comparability of these numbers to the consumer surplus loss estimates may be affected by rounding errors.

IX. Restrictions and the Quality of Service

When considering the potential benefits and costs of relaxing state restrictions on the employment of dental auxiliaries, one must examine the potential effects on the quality of service in addition to the effect on price. Within our empirical framework, we can estimate only the price effect. We draw on the existing literature to determine the expected effects of a relaxation of the restrictions on the quality of dental service.

Scheffman and Appelbaum (1982) present a model of a dental firm that produces its output of services subject to input quality regulation, such as restrictions on the functions that are delegable to auxiliaries. The quality of service is determined by the quality of the inputs, and by the amount of time that the dentist devotes to each patient. As a result, output quality does not necessarily increase when regulation requires an increase in input quality. Rather, output quality could increase, remain constant, or decrease, depending on how the dentist adjusts the time spent with the patient in response to the mandated increase in input quality. Thus, the effect on service quality of the delegation of functions to auxiliaries is an empirical question.

This question is addressed in an extensive literature that documents experiments in public health, university, military, and private dental practices. These studies are almost unanimous in finding that quality is not decreased when expanded functions are delegated to auxiliaries who have been trained in those functions (see Kaplan, 1980; McBride, 1975; General Accounting Office, 1980; Hammons and Jamison, 1967; and Sisty and Henderson, 1974).

Most of the studies compare the technical quality of a single procedure performed by a trained EFDA to the quality when performed by a dental student or dentist. For example, when such tasks as placing rubber dams, taking preliminary impressions, and placing and finishing restorations were examined, there was no statistically significant difference in quality between procedures performed by an auxiliary and those performed by a dental student (Kaplan, 1980;

Rosenblum, 1971). In addition, there is evidence that dental auxiliaries with minimum training can perform prophylactic (cleaning) procedures as well as dental students can (Pelton et al., 1972). There is similar evidence for restorations. All 16 studies surveyed by the General Accounting Office (1980, p. 24) that addressed the quality issue concluded that restorations completed by EFDAs were equal in quality to those completed by control groups of practicing dentists or dental students.[54]

To our knowledge, only one study (Bergner et al., 1983) has found a significant difference in quality between the performance of hygienists and that of dentists. Using a sample of 17 private dental offices in Washington state, the authors found that dentists had a lower frequency of unsatisfactory composite restorations than hygienists had. For amalgam restorations and bitewing radiographs, however, the performance differences between dentists and hygienists were not significant.

A comprehensive study of expanded functions was undertaken at the Forsyth Dental Center in Boston. This study examines dental hygienists' performance of restorative dental procedures (Lobene, 1974; Hankin, 1977). Advanced-skills hygienists were allowed to perform the entire restorative procedure, including administering anesthesia to the patient, cutting the cavities, and placing and carving the restorations. Lobene argues that properly educated dental hygienists can perform restorations at a required quality level.

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[54] The extent of supervision of the EFDA by a dentist, if any, is not discussed in these studies. However, other studies (see Freed et al., 1985 and American Dental Hygienists' Association, 1982) focus on the degree of supervision that dentists currently exercise over dental auxiliaries. These studies present evidence that hygienists have been given a substantial amount of independence in the taking of medical histories and in deciding whether a patient should be referred to the dentist for further treatment.

Evidence from Canada confirms that the quality of care in the dentist's office does not suffer when an expanded function is delegated to an auxiliary. Scheffman and Appelbaum (1982) present empirical results from two studies conducted in Saskatchewan and Ontario, which compare the quality of dental services provided by auxiliaries to that provided by dentists. The quality of amalgam restorations and stainless steel crowns did not differ between the two providers.

In sum, the literature on quality supports the proposition that dental auxiliaries can perform traditional and some expanded functions at the same level of quality as the dentist. This evidence suggests that the relaxation of restrictions on auxiliary use would not reduce the quality of dental care.[55]

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[55] Non-recognition of dentists licensed out-of-state may influence the quality of dentists within a state. Holen's (1978) unpublished paper presents evidence that states with relatively strict licensing standards, and no reciprocal licensing agreements with other states, have lower dentist malpractice insurance premiums. Holen's results are also consistent with the hypothesis that licensing restrictions increase dental service prices, suggesting a possible trade-off between higher prices and higher quality.

Ohio has changed from a recognition state to a non-recognition state because of disciplinary problems under the former system. Nine of 142 dentists licensed by credentials over the period 1974 to 1984 had their dental licenses revoked for felony convictions. However, the executive director of the Ohio State Dental Board attributes the disciplinary problems to a lack of communication between state dental boards rather than to the recognition system itself ("Licensure by Credentials," 1985).

X. Policy Implications

From the findings of this study, we conclude that states that now restrict the number of hygienists per dentist should consider relaxing their restrictions. The evidence in this report is consistent with the hypothesis that if these restrictions were relaxed, consumers would pay lower prices for several dental procedures and a lower average price for a dental visit. These lower prices would provide hundreds of millions of dollars in savings annually to consumers and to the U.S. economy.

Previous studies have concluded that, at lower prices, consumers would buy more dental services and that, as a result, dental health would improve. These conclusions are reinforced by evidence from the extensive quality literature, which shows that dental auxiliaries can perform some expanded functions as well as dentists can. This evidence suggests that the employment of additional hygienists by dentists would not reduce the quality of dental services.

With regard to the remaining restrictions on auxiliary functions, our results do not offer any unequivocal implications for public policy. On the one hand, policy changes may already have eliminated most of these restrictions and rendered the remaining ones ineffectual. On the other hand, improved models and data may be needed to isolate these restrictions' effects. More research is called for, and, in the next section, we will describe some possible directions for this research.

XI. Future Research

The findings presented in this report should be viewed as a step toward a better understanding of restrictions on dental auxiliaries. Additional research is needed to examine some unanswered questions regarding these restrictions, and to evaluate other dental regulations. This research can be focused in several directions.

It would be useful to know more about the production process in the dental service firm. We have tested the hypothesis that a restriction on the use of an auxiliary for a particular service will affect the cost of all services. Other hypotheses are possible, however, and more work would help discriminate among them.

Improved knowledge of optimal auxiliary utilization in large dental firms would allow more accurate estimation of the differential impact of auxiliary restrictions on large commercial practices compared to solo practices. Such estimation would require less aggregated data than are currently available.

Data on the quantity of dental services would permit structural supply and demand equations to be estimated. Such estimation would separate the possible effects of regulations on demand, such as increased waiting time, from the effects on supply, such as decreased efficiency.

The quantity data would have to be less aggregated than the state-level data used in this report: perhaps SMSA-level or individual-firm-level data. Such data could also be used to study regulatory restrictions on advertising and on the number of offices that a dentist may operate. Together with auxiliary use restrictions, these regulations may discourage the delivery of dental services by large commercial practices. Because all these restrictions are likely to have stronger effects where entry is impeded, future work could examine possible interactions between the restrictions and non-recognition of out-of-state licenses.

With regard to the restriction on the finishing of amalgam restorations, we observed significant effects for 1970 but not for 1982. Further research might uncover the reason for this change. Such research would probably require a consistent set of price data over several years. In addition, because regulations vary over time (for example, between 1970 and 1982, 15 states changed their policies regarding recognition), further research would benefit from a model in which regulation is endogenous. The model should probably also include a dental insurance variable, because of the rapid increase in coverage since the early 1970s. This would require disaggregated data on insurance coverage, which are not currently available.

Much work remains to be done on the possible effects of regulation on the quality of dental services. One direction that appears promising is to examine further the relationship between dental malpractice premiums and auxiliary use restrictions.

APPENDIX

TABLE A-1.

Estimation Results for Average Price Equation, 1970

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.64	0.21	2.98*
LIMEXAM	-0.01	0.29	-0.02
LIMRAD	-0.04	0.30	-0.13
LIMFLUOR	-0.17	0.31	-0.56
LIMAMAL	0.82	0.33	2.50*
RECOG	-0.55	0.22	-2.52*
SCHOOL	-0.14	0.45	-0.31
FLUORID	-1.55	0.43	-3.60*
INCP	1.48	0.32	4.59*
AGE	-1.95	5.89	-0.33
URBAN	1.88	1.05	1.80*
Intercept	7.56	2.81	2.69
$R^2 = 0.75$			
F = 13.31			
n = 46			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-2.

Estimation Results for Oral Exam Price Equation, 1970

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.39	0.17	2.32*
LIMEXAM	0.11	0.23	0.49
LIMRAD	-0.02	0.23	-0.07
LIMFLUOR	-0.23	0.24	-0.97
LIMAMAL	0.68	0.26	2.66*
RECOG	-0.07	0.17	-0.43
SCHOOL	-1.44	3.50	-0.41
FLUORID	-1.01	0.34	-3.00*
INCP	0.32	0.25	1.28
AGE	0.25	4.61	0.05
URBAN	0.75	0.82	0.92
Intercept	1.85	2.20	0.84
$R^2 = 0.33$			
$F = 2.97$			
$n = 45$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-3.

Estimation Results for Radiograph Price Equation, 1970

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.19	0.17	1.13
LIMEXAM	-0.36	0.23	-1.58
LIMRAD	0.21	0.23	0.90
LIMFLUOR	-0.17	0.24	-0.69
LIMAMAL	0.45	0.26	1.76*
RECOG	0.10	0.17	0.58
SCHOOL	-0.55	0.35	-1.58
FLUORID	-0.70	0.34	-2.07*
INCP	-0.29	0.25	-1.16
AGE	-8.27	4.62	-1.79
URBAN	1.97	0.82	2.41*
Intercept	9.05	1.81	5.95
$R^2 = 0.23$			
$F = 2.20$			
$n = 45$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-4.

Estimation Results for Prophylaxis Price Equation, 1970

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.92	0.26	3.51*
LIMEXAM	0.06	0.36	0.18
LIMRAD	0.16	0.37	0.45
LIMFLUOR	-0.20	0.38	-0.52
LIMAMAL	0.29	0.40	0.71
RECOG	-0.50	0.27	-1.86*
SCHOOL	0.03	0.55	0.06
FLUORID	-1.45	0.53	-2.72*
INCP	0.93	0.40	2.33*
AGE	12.84	7.26	1.77*
URBAN	1.59	1.29	1.23
Intercept	-0.86	3.47	-0.25
$R^2 = 0.53$			
$F = 5.44$			
$n = 45$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-5.

Estimation Results for Fluoride Price Equation, 1970

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.41	0.23	1.73*
LIMEXAM	-0.12	0.34	-0.35
LIMRAD	0.24	0.35	0.69
LIMFLUOR	-0.10	0.36	-0.29
LIMAMAL	0.47	0.38	1.23
RECOG	-0.16	0.26	-0.62
SCHOOL	0.63	0.52	1.21
FLUORID	-0.95	0.50	-1.88*
INCP	0.50	0.38	1.32
AGE	-4.59	6.89	-0.67
URBAN	0.32	1.22	0.26
Intercept	6.02	3.29	1.83
$R^2 = 0.14$			
$F = 1.68$			
$n = 45$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-6.

Estimation Results for Extraction Price Equation, 1970

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.33	0.16	2.06*
LIMEXAM	-0.11	0.22	-0.52
LIMRAD	-0.04	0.22	-0.18
LIMFLUOR	0.07	0.22	0.29
LIMAMAL	0.54	0.24	2.26*
RECOG	-0.38	0.16	-2.33*
SCHOOL	-0.10	0.34	-0.30
FLUORID	-1.43	0.33	-4.38*
INCP	1.31	0.25	5.25*
AGE	4.57	4.37	1.05
URBAN	2.57	0.81	3.17*
Intercept	-0.20	2.09	-0.01
$R^2 = 0.84$			
F = 21.86			
n = 44			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-7.

Estimation Results for Root Canal Price Equation, 1970

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	3.61	1.97	1.83*
LIMEXAM	-1.69	2.69	-0.63
LIMRAD	-1.32	2.74	-0.48
LIMFLUOR	1.08	2.83	0.38
LIMAMAL	6.31	3.02	2.09*
RECOG	-2.66	2.04	-1.31
SCHOOL	-3.13	4.14	-0.76
FLUORID	-6.40	3.98	-1.61
INCP	0.85	2.98	0.29
AGE	-49.54	54.52	-0.91
URBAN	9.14	9.69	0.94
Intercept	64.84	26.02	2.49
$R^2 = 0.18$			
F = 1.87			
n = 45			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-8.

Estimation Results for Amalgam Restoration (one surface)
Price Equation, 1970

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.57	0.19	2.95*
LIMEXAM	-0.01	0.26	-0.02
LIMRAD	-0.03	0.27	-0.10
LIMFLUOR	0.14	0.28	0.50
LIMAMAL	0.46	0.30	1.56
RECOG	-0.16	0.20	-0.79
SCHOOL	0.33	0.41	0.80
FLUORID	-1.04	0.39	-2.66*
INCP	0.13	0.29	0.43
AGE	3.16	5.35	0.59
URBAN	2.18	0.95	2.29*
Intercept	3.12	2.55	1.22
$R^2 = 0.42$			
$F = 3.86$			
$n = 45$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-9.

Estimation Results for Amalgam Restoration (two surface) Price Equation, 1970

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.60	0.26	2.35*
LIMEXAM	-0.36	0.35	-1.03
LIMRAD	0.07	0.35	0.19
LIMFLUOR	0.06	0.37	0.17
LIMAMAL	0.61	0.39	1.57
RECOG	-0.23	0.26	-0.87
SCHOOL	0.01	0.54	0.03
FLUORID	-1.06	0.52	-2.06*
INCP	0.70	0.39	1.82*
AGE	3.56	7.05	0.50
URBAN	3.07	1.25	2.45*
Intercept	4.53	3.37	1.34
$R^2 = 0.53$			
$F = 5.44$			
$n = 45$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-10

Estimation Results for Gold Inlay Price Equation, 1970

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	2.01	1.57	1.27
LIMEXAM	-1.06	2.14	-0.49
LIMRAD	-0.99	2.18	-0.46
LIMFLUOR	1.28	2.25	0.57
LIMAMAL	1.56	2.40	0.65
RECOG	-1.94	1.62	-1.20
SCHOOL	-5.68	3.29	-1.72
FLUORID	-4.26	3.17	-1.34
INCP	3.32	2.37	1.40
AGE	-45.82	43.34	-1.06
URBAN	5.90	7.70	0.77
Intercept	55.82	20.69	2.70
$R^2 = 0.29$			
$F = 2.64$			
$n = 45$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-11.

Estimation Results for Gold Crown Price Equation, 1970

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	-0.97	3.19	-0.31
LIMEXAM	1.18	4.35	0.27
LIMRAD	-0.39	4.43	-0.09
LIMFLUOR	-0.55	4.58	-0.12
LIMAMAL	0.97	4.89	0.20
RECOG	-3.16	3.29	-0.96
SCHOOL	-4.38	6.70	-0.65
FLUORID	-1.22	6.44	-0.19
INCP	11.15	4.82	2.31*
AGE	-91.41	88.11	-1.03
URBAN	-4.95	15.65	-0.32
Intercept	80.07	42.06	1.90
$R^2 = 0.19$			
$F = 1.92$			
$n = 45$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-12.

Estimation Results for Net Income of Dentists Equation, 1970

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	1.62	0.91	1.78*
LIMEXAM	0.54	1.24	0.43
LIMRAD	-0.98	1.26	-0.78
LIMFLUOR	0.62	1.31	0.47
LIMAMAL	2.45	1.39	1.76*
RECOG	-1.76	0.94	-1.88*
SCHOOL	0.41	1.91	0.21
FLUORID	-0.82	1.84	-0.44
INCP	2.76	1.37	2.01*
AGE	-13.33	25.12	-0.53
URBAN	-0.62	4.46	-0.14
Intercept	20.46	11.99	1.71
$R^2 = 0.24$			
$F = 2.24$			
$n = 45$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-13.

Estimation Results for Average Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.67	0.31	2.16*
LIMAMAL	-0.10	0.32	-0.30
RECOG	-0.33	0.31	-1.04
SCHOOL	-0.02	0.56	-0.04
FLUORID	-1.54	0.61	-2.55*
INCP	1.00	0.32	3.17*
AGE	3.74	6.21	0.60
URBAN	0.39	1.12	0.35
Intercept	3.67	3.44	1.07
$R^2 = 0.42$			
F = 5.24			
n = 47			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-14.

Estimation Results for Oral Exam Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.01	0.17	0.04
LIMAMAL	-0.16	0.17	-0.94
RECOG	-0.34	0.17	-2.04*
SCHOOL	0.003	0.30	0.01
FLUORID	-0.32	0.32	-0.98
INCP	0.23	0.17	1.39
AGE	-1.73	3.31	-0.52
URBAN	0.97	0.60	1.62
Intercept	3.21	1.81	1.77
$R^2 = 0.24$			
$F = 2.89$			
$n^* = 48$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-15.

Estimation Results for Radiograph Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.30	0.20	1.52
LIMAMAL	-0.04	0.20	-0.18
RECOG	0.08	0.20	0.43
SCHOOL	-0.17	0.35	-0.49
FLUORID	-0.37	0.38	-0.96
INCP	0.47	0.20	2.36*
AGE	3.87	3.90	0.99
URBAN	-0.25	0.70	-0.35
Intercept	0.43	2.13	0.20
$R^2 = 0.08$			
$F = 1.48$			
$n = 48$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-16.

Estimation Results for Adult Prophylaxis Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.96	0.38	2.56*
LIMAMAL	-0.03	0.39	-0.08
RECOG	-0.42	0.37	-1.13
SCHOOL	0.02	0.67	0.03
FLUORID	-2.36	0.73	-3.22*
INCP	0.88	0.38	2.31*
AGE	1.52	7.46	0.20
URBAN	0.98	1.35	0.73
Intercept	4.66	4.09	1.14
$R^2 = 0.46$			
$F = 5.94$			
$n = 48$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-17.

Estimation Results for Children's Prophylaxis Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.48	0.30	1.59
LIMAMAL	-0.07	0.31	-0.21
RECOG	-0.36	0.30	-1.19
SCHOOL	0.10	0.54	0.18
FLUORID	-1.44	0.59	-2.45*
INCP	0.27	0.30	0.88
AGE	-0.85	5.99	-0.14
URBAN	0.83	1.08	0.77
Intercept	5.64	3.28	1.72
$R^2 = 0.24$			
$F = 2.84$			
$n = 48$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-18.

Estimation Results for Fluoride Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.76	0.58	1.31
LIMAMAL	-0.07	0.60	-0.11
RECOG	0.05	0.58	0.09
SCHOOL	-1.06	1.04	-1.02
FLUORID	-1.07	1.13	-0.95
INCP	0.59	0.59	1.01
AGE	3.46	11.55	0.30
URBAN	1.79	2.08	0.86
Intercept	4.21	6.33	0.67
$R^2 = 0.06$			
$F = 1.38$			
$n = 48$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-19.

Estimation Results for Amalgam Restoration (one surface-deciduous) Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.70	0.44	1.59
LIMAMAL	-0.09	0.46	-0.21
RECOG	-0.49	0.44	-1.12
SCHOOL	0.71	0.80	0.89
FLUORID	-1.59	0.86	-1.84*
INCP	1.22	0.45	2.73*
AGE	14.11	8.81	1.60
URBAN	-0.92	1.59	-0.58
Intercept	-1.63	4.82	-0.34
$R^2 = 0.27$			
$F = 3.13$			
$n = 48$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-20.

Estimation Results for Amalgam Restoration (two surface-deciduous) Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	1.12	0.49	2.25*
LIMAMAL	-0.19	0.51	-0.38
RECOG	-0.66	0.49	-1.34
SCHOOL	0.42	0.89	0.47
FLUORID	-1.76	0.96	-1.83*
INCP	1.68	0.50	3.35*
AGE	10.96	9.84	1.11
URBAN	-1.39	1.78	-0.78
Intercept	1.71	5.39	0.32
$R^2 = 0.37$			
$F = 4.52$			
$n = 48$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-21.

Estimation Results for Amalgam Restoration (one surface-permanent) Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.97	0.49	2.00*
LIMAMAL	-0.20	0.50	-0.39
RECOG	-0.48	0.48	-0.98
SCHOOL	0.71	0.87	0.81
FLUORID	-2.12	0.95	-2.24*
INCP	1.57	0.49	3.19*
AGE	19.89	9.66	2.06*
URBAN	-1.14	1.74	-0.65
Intercept	-4.39	5.29	-0.83
$R^2 = 0.35$			
$F = 4.23$			
$n = 48$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-22.

Estimation Results for Amalgam Restoration (two surface-permanent) Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	1.41	0.54	2.60*
LIMAMAL	0.04	0.56	0.07
RECOG	-0.42	0.54	-0.78
SCHOOL	0.69	0.98	0.71
FLUORID	-2.32	1.06	-2.20*
INCP	2.30	0.55	4.18*
AGE	21.40	10.80	1.98*
URBAN	-1.93	1.95	-0.99
Intercept	-4.16	5.91	-0.70
$R^2 = 0.44$			
$F = 5.58$			
$n = 48$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-23.

Estimation Results for Gold Inlay Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	9.51	5.42	1.75*
LIMAMAL	3.20	5.63	0.57
RECOG	2.68	5.47	0.49
SCHOOL	5.19	9.87	0.53
FLUORID	-13.78	10.58	-1.30
INCP	11.95	5.54	2.16*
AGE	43.26	108.67	0.40
URBAN	9.95	19.56	0.51
Intercept	11.02	60.13	0.18
$R^2 = 0.17$			
$F = 2.17$			
$n = 47$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-24.

Estimation Results for Gold Crown Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	-0.39	4.07	-0.10
LIMAMAL	-2.44	4.21	-0.58
RECOG	-1.68	4.05	-0.41
SCHOOL	-10.18	7.31	-1.39
FLUORID	-1.81	7.92	-0.23
INCP	9.43	4.11	2.29*
AGE	-86.78	80.83	-1.07
URBAN	12.96	14.59	0.89
Intercept	118.02	44.26	2.67
$R^2 = 0.23$			
$F = 2.73$			
$n = 48$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-25.

Estimation Results for Root Canal Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.26	2.50	0.10
LIMAMAL	-0.66	2.59	-0.26
RECOG	-3.12	2.49	-1.25
SCHOOL	0.89	4.49	0.20
FLUORID	1.86	4.87	0.38
INCP	4.23	2.53	1.67
AGE	-47.39	49.71	-0.95
URBAN	19.72	8.97	2.20*
Intercept	54.17	27.22	1.99
$R^2 = 0.31$			
$F = 3.58$			
$n = 48$			

* Significantly different from zero with the predicted sign at the five percent level or higher.

TABLE A-26.

Estimation Results for Extraction Price Equation, 1982

Explanatory Variable	Coefficient	Standard Error	t-ratio
LIMNUM	0.40	0.32	1.26
LIMAMAL	-0.25	0.33	-0.76
RECOG	-0.29	0.32	-0.93
SCHOOL	-0.01	0.57	-0.02
FLUORID	-1.66	0.62	-2.67*
INCP	1.52	0.32	4.72*
AGE	-0.74	6.33	-0.12
URBAN	2.75	1.14	2.41*
Intercept	1.81	3.47	0.52
$R^2 = 0.64$			
F = 11.33			
n = 48			

* Significantly different from zero with the predicted sign at the five percent level or higher.

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LICENSING RESTRICTIONS AND THE COST OF DENTAL CARE*

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INTRODUCTION

FOR at least thirty years economists have argued that federal regulatory bodies further the interests of the industries they oversee rather than protect consumers. This contention has been embodied in an increasing number of congressional proposals for regulatory reform.[1] More recently economic analysts and policymakers have addressed competitive restraints imposed by licensing boards at the state level. For example, empirical studies have examined professional control among pharmacists and opticians.[2] Concurrent legislation in various parts of the country contemplates reversing promotion, pricing, and licensing restrictions imposed by state licensing boards.[3] For the first time certain of these activities are also being challenged by antitrust prosecutors.[4]

This paper assesses how licensing practices by state authorities influence the availability of dental services. Particular attention is devoted to the refusal of most dental boards to recognize licenses granted in other states.

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[1] For example, the 1975 Amendments to the Securities and Exchange Act abolished price fixing within the brokerage industry that had been countenanced by the Securities and Exchange Commission since 1935. Similar reform has been proposed in the airline and railway passenger travel industries; see Senate Judiciary Comm., 94th Cong., 1st Sess., Civil Aeronautics Board Practices and Procedures (Comm. Print, 1975); and Railroad Revitalization, Hearings Before the H. Interstate & Foreign Commerce Comm., 94th Cong. 1st Sess. (July 1975).

[2] John F. Cady, Restricted Advertising and Competition (Am. Enterprise Inst. 1976); Lee Benham, The Effect of Advertising on the Price of Eyeglasses, 15 J. Law & Econ. 337 (1972).

[3] The California Assembly has considered measures which reverse prohibitions on price advertising imposed by state optometry and pharmacy boards. Following the lead of Colorado, a number of states have adopted "sunset" laws which require occupational boards to justify their competitive restrictions or face termination; Robert L. Simison, New Sunset Laws Seek to Curb Growth of Big Government, The Wall Street Journal, June 25, 1976, at 1.

[4] The Justice Department is suing the Texas State Board of Public Accountancy to overturn a rule which prohibits accountants from submitting competitive bids; Anti-trust Unit Sues Texas Board of Accountancy, The Wall Street Journal, November 19, 1976, at 2.

Average fees for twelve dental services are compared between states that recognize out-of-state licenses and those that do not. Using a dental-services price index, the effects of licensing practices on fees and dentist income are identified econometrically. The potential impact of licensure reform is subsequently considered. While the following discussion focuses on dental care, it bears relevance to licensing restrictions applied in other personal-service industries since in each state as many as forty boards control competition within occupational groups ranging from accountants and lawyers to beauticians and embalmers.

DENTAL LICENSING PRACTICES

Like most regulatory authorities at the state level, dental licensing boards enjoy a high degree of autonomy. In many jurisdictions they work independently of other health agencies and seldom are called upon to answer to the legislatures. Board members are typically drawn from and nominated by members of the profession they regulate. Most states do not permit public board members on the grounds that consumers do not fully understand dental issues. Dental researchers and instructors are also excluded from membership in half of the states.[5] In accordance with prevailing theories of economic regulation, this assures that boards are homogeneous and that licensing rules reflect the interests of practicing dentists.[6] Those interests, of course, include business as well as health concerns.

Licensing boards require aspiring practitioners to pass a series of written and clinical examinations after graduating from institutions accredited by the American Dental Association. The exams place out-of-state applicants at a disadvantage since dental schools in a particular state tend to emphasize material covered on that state's tests.[7] In many cases the clinical portion of the examinations requires complicated procedures that are no longer in general use but are taught in selected states solely to prepare students for examination.[8] As a result failure rates are, in all cases, greater for nonresident applicants than for residents. The mean failure rate of 1960 dental school graduates trained out of state was 19 per cent nationally, while fewer than two per cent of in-state applicants did not pass licensure examinations. Certain states are particularly protective of local interests. In California and

[5] 2 U.S. National Advisory Commission on Health Manpower, Report 503 (1967).

[6] Milton Friedman, Capitalism and Freedom 137-60 (1963). More recently, the public interest and captive theories of regulation have been elaborated and compared by Richard A. Posner, Theories of Economic Regulation, 5 Bell J. Econ. & Management Sci. 335 (1974).

[7] J. E. Regan, State Dental Board Examination Changed, 49 J. Ind. Dental A. 140 (1970).

[8] Similar restrictions are encountered outside the medical professions. For example, the Barber Board of Examiners in California examines applicants extensively on the human circulatory system.

Texas, for example, at least two-thirds of out-of-state applicants are typically denied licenses while 92 to 98 per cent of in-state graduates successfully complete dental board exams.[9] By comparing these failure rates with the demand to enter the profession, Alex Maurizi has demonstrated that licensing boards, in the manner of a cartel, adjust entry standards to protect the incomes of established practitioners during periods of excess demand.[10] These considerations have led informed observers inside and outside the profession to question whether dental boards accurately assess the abilities of applicants or whether their purpose is to constrain artificially the supply of dental practitioners.[11]

In a majority of states regulatory authorities exert further control over the number of dentists by refusing to honor licenses granted in other jurisdictions. Consequently, dentists seeking to practice in those states must pass local examinations regardless of their previous clinical experience. Given the nonstandardized and allegedly irrelevant nature of many license exams, this tends to constrain the supply of dentists and, hence, dental care. In addition to reducing the number of dentists competing in a state, this licensing practice has the secondary effect of insulating practitioners from the *threat* of competition from nonresident dentists who might otherwise migrate. This potential is absent in the fifteen states having reciprocity agreements binding them to endorse each other's licenses.

Available evidence indicates that the thirty-five dental boards which are not parties to reciprocity agreements exercise their discretion to limit immigration of dentists. Those boards fail an average of 22 per cent of nonresident new dental school graduates versus a mean figure of nine per cent in reciprocity states.[12] The disparity is even more pronounced when the failure rate of applicants who are not recent graduates is included. Substantial differences in the number of dentists trained each year within reciprocity and nonreciprocity states are also suggestive of the cartel role assumed by many dental boards. In 1970, for example, reciprocity states graduated 1.78 dental students per 100,000 while there were only 1.02 graduates per 100,000 in the

[9] Brian L. Boulier, Two Essays in the Economics of Dentistry 123 (May 1974) (unpublished Ph.D. dissertation, Princeton University); and Alex Maurizi, Economic Essays on the Dental Profession (1969) (unpublished paper at Univ. of Iowa, College of Business Ad., Iowa City, Ia.).

[10] Alex Maurizi, Occupational Licensing and the Public Interest, 82 J. Pol. Econ. 399 (1974).

[11] As many as 49% of dental school deans and 39% of dental school professors believe that boards do not accurately assess the ability of applicants, according to the American Council on Education, Comm'n on the Survey of Dentistry in the U.S., The Survey of Dentistry; The Final Report (1961). The American Dental Association (ADA) in 1971 gathered extensive data relating licensing-exam failure rates to the class standing of applicants, but it has not seen fit to release those figures.

[12] Alex Maurizi, *supra* note 9.

other thirty-five states.[13] Beyond refusing to honor licenses granted other jurisdictions, then, dental authorities in a majority of states both deny licenses to a disproportionate number of out-of-state applicants and limit the number of new practitioners trained in their states.

THE ISSUES

Licensing restrictions in the thirty-five nonreciprocity states are defended on the grounds that they maintain the quality of dental care. It is alleged that standards would fall if states were to open their doors to all dentists without requiring state recertification or if a system of national licensing were adopted.[14] In making this argument, members of the profession implicitly postulate that deficient practitioners exist in sufficient proportions nationally as to warrant concern. If this is in fact true, current practices merely alter the distribution of substandard dentists. A more enlightened policy might improve the proficiency of dental graduates by replacing or reforming the American Dental Association's role in accrediting dental training institutions.

The quality-of-care defense of licensing practices is inadequate in other respects. First, it ignores the evidence that licensing exams are in many cases unrelated to professional proficiency. Moreover, states that require immigrating practitioners to be reexamined have no such rule for dentistry professors from other states so long as they teach dentists how to practice and refrain from practicing themselves. Finally, no evidence suggests that dental care is inferior where dental boards have entered into reciprocity agreements. To the contrary, even if state-by-state licensing were to raise the caliber of licensed dentists by restricting entry of less-qualified practitioners, the overall level of dental health might well be lower in nonreciprocity states where supply restriction forces consumers to forgo treatment or substitute self-treatment and the advice of friends for professional care.[15]

Members of the dental profession exhibit a keen awareness of how licensing practices affect their financial interests. Surveys of professional attitudes reveal that where fees are higher than average, dentists are more opposed to reciprocity agreements between states.[16] Apparently it is understood that maintaining relatively high prices requires the forestalling of market entry.

[13] From U.S. Dep't of Health, Education, and Welfare, Nat'l Health Center for Statistics, Health Resources Statistics, 1971, at 78-79.

[14] See, for example, Joseph A. Devine, The Issue of Reciprocity, 91 J. Am. Dental A. 746 (1975); and Theodore R. Lerner, Licensure: Facing the Real Problems, 91 J. Am. Dental A. 742 (1975).

[15] H. E. Frech, Occupational Licensure and Health Care Productivity: The Issues and the Literature, in Health Manpower and Productivity 121 (John Rafferty ed. 1974).

[16] Brian L. Boulier, *supra* note 9, at 121.

As would be expected, reciprocity is accorded greater support among dentists practicing in low-fee areas. Similarly, young dentists establishing practices and older dentists contemplating partial retirement favor the improved mobility associated with reciprocity.

Four economic analyses have established the impact of dental licensing practices on the geographical distribution of practitioners. Using two measures of mobility, Arlene Holen concluded that the lack of reciprocity in most states significantly impairs mobility and that the licensing of dentists is more restrictive in this sense than certification of physicians. She found licensing practices to be as limiting for dentists as for lawyers, although legal practice requires familiarity with the laws of specific states while dental principles are broadly applicable.[17] Boulier provides further evidence that dental certification practices have adversely altered the distribution of practitioners, exacerbating the national shortage of dentists.[18] Research by Maurizi and by Benham, Maurizi, and Reder indicates that the number of dentists per capita tends to increase over time where initially dental income is relatively high and where reciprocity covenants facilitate migration.[19] Apparently, then, competitive forces encountered in other markets prevail in the market for dental services but only in the absence of regulatory intervention.

THE PRICE OF DENTAL SERVICES

While these studies demonstrate that in a majority of states licensing practices diminish competition, they make no attempt to ascertain the degree to which dentists, so protected, exercise their discretion to charge higher fees than an unrestricted market would sustain. Differences in dental fees between reciprocity and nonreciprocity states shed some light on this question. The required data are available in detail from the 1970 American Dental Association National Dental Fee Survey.[20] These data reflect average prices charged for various dental procedures by 10,000 responding general practitioners, approximately 25 per cent of the U.S. practitioner population. Reported fees may understate or overstate the absolute level of dental charges due to nonresponse bias. However, there is little reason to believe *a priori* that price differences noted between reciprocity and nonreciprocity states would be unrepresentative. Survey response rates in individual states appear to bear little relation to prevailing licensing practices.

[17] Arlene Holen, Effects of Professional Licensing Arrangements on Interstate Labor Mobility and Resource Allocation, 73 J. Pol. Econ. 492 (1965).

[18] Brian L. Boulier, *supra* note 9, at 121.

[19] Alex Maurizi, *supra* note 9; Lee Benham, A. Maurizi, & M. W. Reder, Migration, Location, and Remuneration of Medical Personnel: Physicians and Dentists, 50 Rev. Econ. & Stat. 332 (1968).

[20] Results are published in American Dental Association, Bureau of Economic Research and Statistics, National Dental Fee Survey, 1970, 83 J. Am. Dental A. 57 (1971).

TABLE 1
AVERAGE PRICE OF SELECTED DENTAL SERVICES—DEFLATED (1970)

Service	Price in Reciprocity States	Price in Non-reciprocity States	Difference (percentage)
Periodic oral exam	$ 3.44	$ 3.75	9.0
Complete series of X-rays	5.47	5.65	3.3
Dental prophylaxis	7.61	8.26	8.5
Simple tooth removal	6.32	7.45	17.9
Root canal extirpation and filling	51.37	56.42	9.8
Amalgam filling (one surface)	6.33	6.52	3.0
Amalgam filling (two surfaces)	10.05	10.35	3.0
Gold inlay (two surfaces)	47.00	50.73	7.9
Cast gold crown	70.38	74.72	6.2
Bridge (two units)	143.23	154.19	7.7
Acrylic-base denture	147.50	150.33	1.9
Denture repair	16.41	16.38	−0.2

Source: American Dental Association, Bureau of Economic Research and Statistics, National Dental Fee Survey, 1970, 83 J. Am. Dental A. 57 (1971).

For eleven of the twelve most common services, fees were found to be higher in states that lack reciprocity (Table 1). Differences were statistically significant at the 95 per cent level for seven of these services when regional cost-of-living variations were accounted for.[21] Where state dental boards impede the entry of nonresident practitioners, periodic oral exams, dental prophylaxis, and tooth removals were on the average 8.5 to 17.9 per cent more expensive. Those procedures constituted more than one-half of all services performed by U.S. dentists. Fees were also substantially greater for the more involved root canal, gold inlay, gold crown, and dental bridge procedures. Price differences were smaller for X-rays, fillings, and the fitting of dentures.[22] The average fee for one service, denture repair, was comparable in reciprocity and nonreciprocity states. This moderately priced procedure accounts for fewer than one-half of one per cent of all dental visits.

The prices of the services listed in Table 1 were used to generate a dental-services price index. Weights were obtained from Poetsch and Moen's esti-

[21] These and subsequent data were deflated by a regional price index composed by averaging values of Consumer Price Index, January 1970 (U.S. Bureau of Labor Stat.) for standard metropolitan statistical areas falling in each region. Due to the limited size of samples in Alaska, Delaware, North Dakota, South Dakota, and Utah, those states were excluded from consideration. The test statistic

$$z = \frac{\bar{x}_1 - \bar{x}_2}{[\sigma_1^2/n_1 + \sigma_2^2/n_2]^{\frac{1}{2}}}$$

was adopted to test the significance of differences between mean values in reciprocity and nonreciprocity states.

[22] Differences were significant at the 81% to 84% levels of confidence only.

mates of the number of dental services supplied in the United States.[23] The average value of the index was $12.08 in states with reciprocity and $12.86 elsewhere (Table 2). The 6.5 per cent differential is statistically significant at the 99.5 per cent level of confidence. As Table 3 reveals, average dentist net income also was greater in nonreciprocity jurisdictions. The 5 per cent disparity represents a statistically significant difference, tending to confirm that the thirty-five dental boards have successfully limited competition through their licensing practices. The lower coefficient of variation of dentist earn-

TABLE 2
VALUES OF THE DENTAL SERVICES PRICE INDEX BY STATE—DEFLATED (1970)

Nonreciprocity States		Reciprocity States	
Alabama	$11.54	Illinois	$12.95
Arizona	13.00	Indiana	12.10
Arkansas	10.95	Iowa	11.30
California	15.58	Kansas	11.94
Colorado	12.77	Kentucky	10.89
Connecticut	13.93	Minnesota	11.90
Florida	13.96	Missouri	12.10
Georgia	12.82	Nebraska	11.68
Hawaii	13.41	New Hampshire	13.10
Idaho	11.51	Ohio	12.65
Louisiana	12.96	Oklahoma	11.76
Maine	10.70	Pennsylvania	12.28
Maryland	13.86	Rhode Island	12.43
Massachusetts	13.68		
Michigan	13.30	Average	12.08
Mississippi	11.51		
Montana	12.73	Average (all states)	12.64
Nevada	15.35		
New Jersey	14.55		
New Mexico	12.65		
New York	14.46		
North Carolina	12.68		
Oregon	13.13		
South Carolina	11.68		
Tennessee	11.72		
Texas	13.89		
Vermont	12.51		
Virginia	13.04		
Washington	13.70		
West Virginia	10.76		
Wisconsin	11.69		
Wyoming	11.68		
Average	12.86		

Source: See note 23 & text at note 23 *supra*.

[23] W. E. Poetsch & B. Duane Moen, Survey of Dental Services Rendered, 1969, 81 J. Am. Dental A. 25 (1970).

TABLE 3
NET DENTIST INCOME BY STATE—DEFLATED (1970)

Nonreciprocity States	Net income	Reciprocity States	Net income
Alabama	$25,366	Illinois	$24,633
Arizona	23,775	Indiana	25,271
Arkansas	24,036	Iowa	23,648
California	30,842	Kansas	23,975
Colorado	23,244	Kentucky	22,632
Connecticut	26,964	Minnesota	23,652
Florida	29,602	Missouri	26,898
Georgia	28,585	Nebraska	23,739
Hawaii	33,876	New Hampshire	23,003
Idaho	19,870	Ohio	25,666
Louisiana	25,408	Oklahoma	24,899
Maine	21,104	Pennsylvania	22,953
Maryland	28,537	Rhode Island	27,303
Massachusetts	24,847		
Michigan	26,625	Average	24,482
Mississippi	23,072	Coefficient of variation	0.06
Montana	20,348		
Nevada	27,750	Average	
New Jersey	27,573	(all states)	25,409
New Mexico	25,137		
New York	27,396		
North Carolina	29,090		
Oregon	22,948		
South Carolina	26,611		
Tennessee	24,663		
Texas	23,628		
Vermont	27,189		
Virginia	28,506		
Washington	28,318		
West Virginia	21,625		
Wisconsin	24,488		
Wyoming	23,760		
Average	25,774		
Coefficient of variation	0.12		

Source: American Dental Association, Bureau of Economic Research and Statistics, 1971 Survey of Dental Practice II, Income of Dentists by Location, Age, and Other Factors, 84 J. Am. Dental A. 397, 400 (1972).

ings in reciprocity states is consistent with the conclusion that greater competition prevails within and among those states.

THE MODEL

In order to provide more definitive evidence about the effects of licensing restrictions, an econometric model was constructed consisting of four structural equations simultaneously determining the supply of practitioners, the demand for and supply of dental care, and dentist earnings:

$$\begin{aligned}\text{Dentists} &= f(\text{licensure restrictions, earnings, } X_1 \ldots X_m)\\ \text{Price} &= f(\text{quantity of care, } Y_1 \ldots Y_n)\\ \text{Price} &= f(\text{quantity of care, dentists, } Z_1 \ldots Z_o)\\ \text{Earnings} &= f(\text{dentists, } Y_1 \ldots Y_n, Z_1 \ldots Z_o),\end{aligned}$$

where $X_1 \ldots X_m$, $Y_1 \ldots Y_n$, and $Z_1 \ldots Z_o$ are, respectively, additional factors influencing quantity of dentists, dental demand, and dental supply.

In accordance with theoretical precepts, it was hypothesized that in each state the supply of dentists per 100,000 population (D) is affected by the mean level of net dentists income (YD). Dental schools per 100,000 population (SCH) and rate of urbanization (U) were also said to influence the proportion of practitioners in the population. While higher prices and more schools were expected to raise D, the effects of urbanization, which depend upon how dentists perceive the amenities and disamenities associated with metropolitan life, were not clear *a priori*. The impact of licensing practices was captured by a dichotomous variable R, which assumed a value of 1 where a state's dental board recognized licenses granted in other states and 0 elsewhere. Therefore, the null hypothesis that reciprocity agreements have negligible influence on the number of practitioners would be substantiated by a coefficient on R that was not significantly different from zero.

A major obstacle in analyzing the effects of dental regulation is the absence of published data relating the quantity of dental care delivered in each state. The American Dental Association has gathered such data as part of its survey of the dental profession but publishes output figures on a regional basis only.[24] In this study the quantity of service per capita rendered in a state was estimated according to

$$Q = \frac{D \cdot S}{POP},$$

where D is the number of dentists in the state, POP represents the state's population, and S is the number of patient sittings per practitioner in the geographical region in which the state is located. Because S is available on a regional basis only, caution must be exercised in applying coefficients associated with Q.

Price was established as the independent variable in the demand relationship. Looking across states, the dental services price index (P) was assumed to vary with the population's mean income in thousands of dollars (Y) and mean age (AGE) as well as estimated annual dental visits per capita (Q). The

[24] Other analysts have dealt with this limitation by combining cross-section and time series regional data; Paul J. Feldstein, Financing of Dental Care: An Economic Analysis 143-240 (1973). Since licensing practices vary by state rather than region, that approach would not have proven fruitful in this study.

percentage of the population consuming naturally or artificially fluoridated water (FL) was proposed as a final determinant of demand. Theory predicts that positive and negative coefficients will be associated with the income and quantity terms, respectively. Previous empirical work indicates that widespread fluoridation coincides with reduced dental demand and that demand is greatest among lower age groups.[25]

On the supply side, price was determined by the quantity of service rendered (Q), the number of dentists per 100,000 population (D), the percentage rate of urbanization (U), and the existence of reciprocity agreements (R). It was anticipated that higher prices would be associated with greater output and fewer practitioners. Higher input costs in urban areas would lead to a positive coefficient on U. In the supply equation, R was intended to capture the secondary impact of licensing restrictions, independent of their direct effect on price through number of practitioners. This secondary impact would arise if, by limiting the number of *potential* as well as actual competitors, immigration restrictions in one state permit practitioners to raise fees above levels prevailing in a reciprocity state having the *same* number of practitioners per capita. If, on the other hand, reciprocity affects dental pricing solely by constricting the supply of practitioners within a state, reciprocity and nonreciprocity states having the same proportion of dentists represented in the population will have similar fees and the coefficient associated with R will be insignificant.

The average net income of dentists (YD) was assumed to vary with the determinants of demand (Y, AGE, and FL) and supply (D, U, and R). Looking across states lower mean age, less extensive fluoridation, fewer dentists per 100,000, and greater per capita income were expected to be associated with increased dentist income. The effect of urbanization on earnings could not be established *a priori* since higher prices prevailing in urban settings may raise the income requirements of dentists or reduce their earnings by increasing the factor prices they pay. A positive coefficient on R would confirm that reciprocity benefits practitioners other than by restricting the number of dentists practicing in a state.

Empirical Results

The simultaneous relationships were estimated using two-stage least squares procedures with endogenous variables P, Q, YD, and D. Dental data originated in the American Dental Association survey discussed above while demographic figures came from census publications. Variables P, Y,

[25] To capture the inverted "U" relationship between age and demand noted by Feldstein, the parabolic term $(AGE)^2$ was included in early estimations of the model (*id.* at 30-32). However, this raised collinearity in first- and second-stage estimates without materially improving results.

and YD were adjusted for regional price differences as discussed previously. In the estimated equations, all coefficients carried expected signs (Table 4) and a high degree of the variance in the endogenous variables was explained.[26] Coefficients on all variables except U, AGE, and Q were significantly different from zero at the 95 per cent level. The lack of significance of the quantity coefficients no doubt reflects the limited accuracy of estimated values of Q. Analysts working with more precise quantity data consistently detect strong quantity-price relationships, verifying the validity of price as an allocating mechanism for dental care.[27]

The cross-sectional analysis revealed that, with other factors equal, proportionately more dentists will locate where dental schools are more numerous and where dentist incomes are higher (equation 1). At the margin a 10 per cent rise in dentist income was associated with a 42 per cent increase in a state's endowment of dentists. This high degree of responsiveness persistently appeared in alternative specifications of the model. The data indicate no clear preferences of dentists for urban or nonurban areas consistent with earlier findings that the locational preferences of practitioners have been unstable over time.[28] The positive coefficient on R confirmed that reciprocity tends to augment an area's supply of dentists. Under reciprocity the number of dentists is estimated to be greater by 10.24 per 100,000 persons or 24 per cent evaluated at the mean value of D. This observation refutes the null hypothesis that licensing restrictions do not alter the distribution of practitioners.

A negative relationship prevails between dental fees and quantity of dental service demanded (equation 2). However, this relationship was not statistically significant. In accord with previous research,[29] youthful populations tend to have greater dental demand. One per cent changes in state per capita income and fluoridation rates are estimated to alter price by 0.51 and −0.49 per cent, respectively. This compares with elasticity estimates of 0.25 and −0.04 made by Kushman and Scheffler.[30]

Higher fees were associated with greater output in the supply equation. The urbanization term carried a positive coefficient as was expected. Prices

[26] The r^2 values for the reduced-form expressions for D, P, Q, and YD were, respectively, 0.46, 0.55, 0.55, and 0.47.

[27] By combining aggregate cross-section and time series data, Feldstein estimated significant elasticities of demand and supply of 1.43 and 0.29, respectively; Paul J. Feldstein, *supra* note 24, at 39. Smaller elasticity estimates have been derived using survey data; A. G. Holtman & E. O. Olsen, Jr., The Demand for Dental Care: A Study of Consumption and Household Production, 11 J. Human Resources 546 (1976).

[28] Lee Benham, A. Maurizi, & M. W. Reder, *supra* note 19.

[29] Paul J. Feldstein, *supra* note 24, at ch. 2.

[30] J. E. Kushman & R. M. Scheffler, Pricing Health Services: Verification of a Monopoly Pricing Model for Dentistry, J. Human Resources (forthcoming).

TABLE 4

EMPIRICAL ESTIMATES FOR DENTAL SERVICES MARKET USING STATE DATA (1970)*

Number of Practitioners	$D = 7.04YD + 110.72SCH - 0.18U + 10.24R - 129.30$ (2.61) (53.37) (0.24) (4.50) (52.84)	(1)
Demand for Dental Services	$P = -0.82Q + 1.60Y - 0.091AGE - 0.16FL + 9.25$ (1.48) (0.65) (0.084) (0.06) (2.35)	(2)
Supply of Dental Services	$P = 3.63Q - 0.10D + 0.032U - 0.85R + 10.21$ (3.01) (0.04) (0.009) (0.21) (0.92)	(3)
Dentists' Net Income	$YD = -0.17D + 1.29Y - 020AGE - 0.40FL + 0.062U - 1.36R + 22.48$ (0.10) (0.64) (0.27) (0.20) (0.041) (0.81) (8.26)	(4)

* Parenthetical figures represent estimated standard errors.

	Sample Mean
D = dentists per 100,000 population	42.9
YD = mean net dentist income ($1,000)	25.4
SCH = dental schools per 100,000 population	.025
U = rate of urbanization	66.6
R = reciprocity (1, 0)	
Q = annual dental visits per capita	1.52
P = dental-services price index	12.61
Y = average annual income per capita (1,000)	4.00
AGE = mean age of population	27.7
FL = percentage of population drinking fluoridated water	38.9

also tended to be greater where, as in nonreciprocity states, there were fewer dentists per capita. The negative coefficient associated with reciprocity in the last equation bears evidence of the secondary impact of immigration restrictions in constraining supply: lack of reciprocity leads to higher fees by insulating dentists from potential out-of-state competition as well as by directly limiting the number of in-state competitors. These combined factors are estimated from the structural equations to have increased fees in nonreciprocity states by

$$\Delta P = .10\,(10.24) + .85 = \$1.87.$$

Thus, lack of reciprocity in a majority of the fifty states appears to raise the price of dental services by about 14.9 per cent. Somewhat more than half of this increment arises from the direct impact of licensing constraints on the supply of practitioners in a state while the remainder is attributable to the secondary impact coincident to restrictive licensure. The price impact of reciprocity compares to differences of 5 per cent and 25 to 40 per cent associated with state regulation of the pharmacy and optometry professions.[31]

The final equation indicates that greater dentist income coincides with increased per capita income and use of fluoridated water. The effects of urbanization are ambiguous. Dentist earnings, of course, are inversely related to the proportion of dentists in the population. From equations (1) and (4) lack of reciprocity is estimated to reduce average dentist income by

$$\Delta YD = .17\,(10.24) + 1.36 = 3.10 \text{ or } \$3{,}100.$$

This 12 per cent increment corresponds closely to the impact of licensing restrictions on dental fees.

Public concern about professional licensing practices has motivated previously cited proposals for reform.[32] This evidence indicates that such concern is well founded. Lack of licensing reciprocity in the dental profession appears to have yielded significantly higher dental fees and dentist income. This, in turn, suggests that less dental care has been rendered under the existing regulatory regime than a competitive market would produce. Results of this study substantiate that under a revised system of licensure[33]

[31] John F. Cady, *supra* note 2, at 11; and Lee Benham *supra* note 2, at 446. Because the eyeglass market studied by Benham enjoys a broader range of competitive practices (for example, widespread advertising and price discounting) than many professions, the observed effects of professional control might be expected to be greater where it exists among optometrists.

[32] See Consumers Union of the U.S., State Dental Boards Check Competition, Not Confidence, Consumer Reports, July 1975, at 445.

[33] Regulatory reform might take the form of national licensure or certification as discussed by Milton Friedman, *supra* note 6, at 137-60. Nathan Hershey has proposed a system of institu-

practitioners would be attracted to areas where fees are above average. Empirical findings also demonstrate that an increase in the number of dentists in high-fee areas has the potential of reducing differences in dentist income and the price of dental care. Costs of licensing reform would be borne by dentists in nonreciprocity regions and by residents of reciprocity jurisdictions (where dental fees are artificially low) since practitioners could be expected to relocate in states that previously had restrictive licensing practices.

This discussion has been limited to the effects of licensing restrictions associated with lack of interstate reciprocity. It should be noted that medical authorities at times employ additional means to exclude potential market entrants. For example, in Indiana, a reciprocity jurisdiction, recent provisions enable the dental board to disqualify persons for unsatisfactory "appearance, attitude, and housekeeping" even if they pass dental exams.[34] Frech presents a startling body of evidence indicating that ethnic and sexual discrimination has arisen from other entry restrictions imposed by organized medicine.[35] Recently California authorities have discovered that dental board licensing examiners marked exams with codes corresponding to minority applicants' ethnic identity, religion, or sex. In light of these abuses, public policy providing for comprehensive licensure reform might have greater impact on the availability of dental services than these results suggest.

SUMMARY

Empowered by the state legislatures and aligned with the profession they oversee, dental licensing boards inhibit competition through restrictive licensing practices. In the manner of a cartel, most boards have used licensing exams to limit the entry of nonresident practitioners while the number of new dentists trained in their states has also been constrained. This study provides evidence that where regulatory authorities have constructed competitive barriers, dentists systematically raise fees augmenting their earnings. It is estimated that the price of dental services and mean dentist income are between 12 and 15 per cent higher in nonreciprocity jurisdictions when other factors are accounted for. Overall, the annual cost of this form of professional control is approximately $700 million.[36] Pending proposals for

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tional licensure; An Alternative to Mandatory Licensure of Health Professionals, 50 Hospital Progress 71 (1969). Reuben A. Kessel's proposal for relicensure represents still another alternative; The A.M.A. and the Supply of Physicians, 35 Law & Contemp. Prob. 267 (1970).

[34] U.S. National Advisory Commission on Health Manpower, *supra* note 5.

[35] H. E. Frech, *supra* note 15, at 119-39.

[36] Estimates are based on the ADA survey and Consumer Price Index, January 1971 (U.S. Bureau of Labor Stat.); *id.*, January 1976.

licensure reform could eliminate these costs while effecting a more efficient geographical distribution of dentists. These conclusions may have broader applicability given the large number of occupational groups that control the competitive environment in which they operate through state licensing boards.

THE EFFECT OF COMMERCIAL PRACTICE RESTRICTIONS: THE CASE OF OPTOMETRY*

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I. INTRODUCTION

CURRENT regulatory policy toward the business practices of optometrists is based on the assumption that the market fails because (1) consumers are faced with the dilemma of selecting an optometrist without the benefit of full information on the quality of goods and services provided by available optometrists and (2) some optometrists exploit this asymmetric information between consumers and sellers by lowering quality. This assumption has led to the inference that regulation of optometrists' production and information dissemination processes is necessary to protect consumers from their own purchase decisions and from unfair seller behavior. Examples of current commercial practice regulations include state restrictions on (1) the employment of optometrists by nonprofessional corporations,[1] (2) the permissible locations of optometrists' offices, (3) the operation of multiple offices by optometrists, and (4) the use of trade names by optometrists employed by nonprofessional corporations.

Although there is theoretical support for the argument that asymmetric consumer information about product quality will result in market failure,[2]

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[1] Professional corporations differ from nonprofessional corporations in that professional corporation law requires each stockholder of a professional corporation to be a licensed member of the profession for which the corporation is organized to practice. See, generally, Seymour L. Coblens, Optometry and the Law (1976).

[2] For example, George A. Akerlof, The Market for "Lemons": Quality Uncertainty and the Market Mechanism, 84 Q. J. Econ. 488 (1970); Hayne E. Leland, Quacks, Lemons, and Licensing: A Theory of Minimum Quality Standards, 87 J. Pol. Econ. 1328 (1979); Richard

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the commercial practice restrictions imposed on optometrists are increasingly being perceived as a means to serve some optometrists' self-interests rather than the "public interest." The Federal Trade Commission (FTC) has argued that state restrictions on employment, location, branch offices, and trade names serve some optometrists' self-interests by restricting the growth of high-volume, chain vision-care outlets.[3] Further restrictions on optometrists' advertising have been shown to increase the price of ophthalmic goods and services[4] and to increase price without increasing quality.[5]

While a large body of empirical evidence exists on the effect of advertising restrictions, little empirical evidence exists on the effects of other commercial practice restrictions, such as the employment, location, branch office, and trade name restrictions. Benham and Benham and the FTC estimated the effect of the degree of professional control;[6] however, neither study measured professional control on the basis of the extent of state commercial practice restrictions. Benham and Benham measured professional control as (1) the proportion of optometrists within each state belonging to the American Optometric Association (AOA), (2) the market share of large chain optical firms, and (3) the assessment of five representatives of large chain optical firms of the "difficulty which a commercial firm has entering and operating in a state for reasons other than competition with existing commercial firms."[7] The FTC measured professional control as the presence or absence of chain optical firms employing optometrists and as the type of media advertising observed in the area.[8]

Both the Benhams' and the FTC's studies are subject to the problem of

Schmalensee, A Model of Advertising and Product Quality, 86 J. Pol. Econ. 485 (1978); Dennis E. Smallwood & John Conlisk, Product Quality in Markets Where Consumers Are Imperfectly Informed, 93 Q. J. Econ. 1 (1979); and Charles Stuart, Consumer Protection in Markets with Informationally Weak Buyers, 12 Bell J. Econ. 562 (1981).

[3] Federal Trade Commission, State Restrictions on Vision Care Providers: The Effects on Consumers ("Eyeglasses II") (July 1980).

[4] For example, Lee Benham, The Effect of Advertising on the Price of Eyeglasses, 15 J. Law & Econ. 337 (1972).

[5] For example, Federal Trade Commission, Effects of Restrictions on Advertising and Commercial Practice in the Professions: The Case of Optometry (September 1980); Roger Feldman & James W. Begun, The Effects of Advertising: Lessons from Optometry, 13 J. Hum. Resources 247 (Suppl. 1978); and John E. Kwoka, Advertising and the Price and Quality of Optometric Services, 74 Am. Econ. Rev. 211 (1984).

[6] Lee Benham & Alexandra Benham, Regulating through the Professions: A Perspective on Information Control, 18 J. Law & Econ. 421 (1975); and Federal Trade Commission, *supra* note 5.

[7] Benham & Benham, *supra* note 6, at 426–27.

[8] Federal Trade Commission, *supra* note 5, at 2.

TABLE 1

CLASSIFICATION PROBLEMS IN EARLIER STUDIES

Standard Metropolitan Statistical Areas	FTC Classification of Restrictiveness*	Benham & Benham Classification†	Number of Pearle Vision Center/ Texas State Optical Stores by State, 1983
Knoxville, Tenn.	Most	Restrictive	27
Little Rock, Ark.	Most	Restrictive	13
Providence, R.I.	Most	Not included	2
Columbia, S.C.	Next most	Restrictive	15
Greensboro, N.C.	Next most	Restrictive	18
Milwaukee	Next most	Other	11
Portland, Or.	Next least	Other	0
Columbus, Ohio	Next least	Nonrestrictive	24
Baltimore	Least	Nonrestrictive	34
Washington, D.C.	Least	Nonrestrictive	1
Seattle	Least	Other	5
Minneapolis	Least	Nonrestrictive	20

SOURCES.–Federal Trade Commission, Effects of Restrictions on Advertising and Commercial Practice in the Professions: The Case of Optometry 41, table 2-1 (September 1980). Lee Benham & Alexandra Benham, Regulating through the Professions: A Perspective on Information Control, 18 J. Law & Econ. 421, 426–27 n.14 (1975). Pearle Health Services, Inc., Prospectus 12 (September 16, 1983).

* A Standard Metropolitan Statistical Area (SMSA) was classified as "most restrictive" if chain firms and advertising were not observed, as "next most restrictive" if nonprice advertising of eyeglasses was observed, as "next least restrictive" if nonprice advertising of eyeglasses and exams and chain firms were observed, and as "least restrictive" if price advertising of eyeglasses and chain firms were observed.

† A state was classified as "restrictive" if at least one representative of the commercial firms surveyed included it among the most difficult states and as "nonrestrictive" if at least one respondent included it among the least difficult states. The remaining states were designated as "other."

errors in variables. Certain states that are classified laissez-faire may actually be restrictive, and certain states classified as highly restrictive may be less restrictive.[9] Table 1 shows that states included by the Benhams in the most restrictive category are not included in the FTC's most restrictive category. And each study classifies states as least restrictive that the other study does not.[10] Further, there is a weak relationship between both the Benhams' and the FTC's classifications of markets by

[9] For example, the FTC classified Seattle as least restrictive, yet optometrists in Washington State are subject to three commercial practice restrictions, namely, the employment restriction by court order, the location restriction by state board regulation, and the trade name restriction by statute. Little Rock, Arkansas, was classified as most restrictive, yet optometrists in Arkansas are subject to only the employment restriction. Benham & Benham, *supra* note 6, at 426.

[10] The Benhams mention in a footnote that even the five representatives of the large commercial firms did not always agree on which states should be included in the restrictive and nonrestrictive categories. Benham & Benham, *supra* note 6, at 426.

restrictiveness and the presence of commercial optical firms, measured as the number of retail optical stores operated or franchised by Pearle Health Services, the largest retailer of ophthalmic goods and services in the United States.[11]

This study does not attempt to classify states by restrictiveness and, as a result, is not plagued by a similar errors-in-variables problem. This paper estimates the effect of the presence of specific commercial practice restrictions. The restriction is present in a state if it is imposed by state statute, board of optometry regulation, court decision, or attorney general opinion.[12] The effects of the restrictions will depend on enforcement, but measurement of the presence of restrictions by state does not.[13]

Accordingly, after a brief description of the market for ophthalmic goods and services and an analysis of the commercial practice restrictions, this paper presents an econometric study of the economic effect of the employment, location, branch office, and trade name restrictions. In particular, the effects of these restrictions on the price and quality of eye examinations and eyeglasses provided by optometrists are analyzed in markets characterized by different levels of consumer information and entry barriers. Further, this research provides a preliminary test of a recent amendment to the economic theory of regulation—that the regulatory process can be used as a strategic weapon by subgroups of firms within an industry against other subgroups within that industry.

II. The Market for Ophthalmic Goods and Services

Most optometrists are self-employed; however, the market share of lay-employed optometrists (optometrists employed by drug and department stores and other nonprofessional optical firms) is increasing. In 1977, 80

[11] This is due in part to the difference between the FTC's classification criteria, the presence of optical firms employing optometrists, and Pearle Health Service's marketing strategy. "The Companies' marketing strategy is premised upon the availability of optometric services at or near the location of the retail optical store. . . . In nine states of the United States, the Company employs optometrists to provide eye examinations and related services. In most other jurisdictions in which the Company operates stores, the Company leases space adjacent to the retail optical store to an optometrist who provides these services." Pearle Health Services, Inc., Prospectus, 11–13 (September 16, 1983).

[12] Certain state optometric associations' rules of practice and codes of ethics also suggest ways to establish and maintain one's practice; however, the private association's only enforcement mechanism is expulsion from membership. Many optometrists choose not to belong in the first place.

[13] The commercial practice restriction data were obtained from the July 1980 FTC report ("Eyeglasses II") and then cross-checked with the state optometry laws listed in the 1978 Blue Book of Optometrists. A further check was made by writing to each state board of optometry and state optometric association.

percent of all optometrists were self-employed, 4 percent were employed by professional corporations, 2 percent by nonprofessional corporations, and 14 percent by the government, other optometrists, or ophthalmologists.[14] Between 1973 and 1984 the market share of optical chain firms increased from 3 to 15 percent in the market for eye examinations and from 7 to 20 percent in the market for eye wear.[15]

Many self-employed optometrists and optometrists employed by professional corporations oppose the provision of ophthalmic services by nonprofessional optical firms. Lay-employed optometrists, opponents argue, may employ a variety of cost-cutting techniques, such as providing brief and inadequate eye examinations, in order to increase profits. Further, lay-employed optometrists practicing under a trade name lack personal accountability and the need to maintain a personal reputation for high-quality service. Opponents also argue that the management of nonprofessional optical firms may interfere in the doctor-patient relationship and with professional judgments concerning patient welfare. Thus opponents argue that commercial practice restrictions are necessary to prevent lay-employed optometrists from increasing their market share by selling services at lower prices and substituting low- for high-quality care without consumer recognition of this change in quality.[16]

III. Commercial Practice Restrictions in Optometry

Optometric jurisprudence is state oriented. All states and the District of Columbia require the licensure of optometrists. The state licensing statutes define the functions of the optometric profession and limit the performance of these functions to licensed persons. The state licensing statutes also provide for the establishment of state boards of examiners in optometry to perform licensing and regulatory functions. The state boards are authorized to issue rules and regulations, to define requirements for licensure, and to discipline persons who have violated the licensing statutes. Where state laws do not delineate specific grounds for license suspension or revocation, the state boards are usually empowered to define "unprofessional" or "unethical" conduct, which is grounds for license suspension or revocation in most states.

This state-by-state self-regulation has resulted in wide cross-sectional variation in the type of commercial practice restrictions placed on op-

[14] U.S. Dep't of Health, Education, & Welfare, Bureau of Health Management, Supply of Optometrists in the United States, Current and Future 16 (October 1978).

[15] Pearle Health Services, Inc., Annual Report 4 (1983).

[16] See Federal Trade Commission, *supra* note 3, at 29–35.

tometrists. Table 2 shows that, in 1980, state laws, regulations, attorney general opinions, and court decisions existed in thirty-seven states concerning the employment of optometrists by nonprofessional firms, in twenty-eight states concerning the permissible locations of optometrists' offices, in twenty-two states concerning the number of branch offices an optometrist may operate, and in forty-one states concerning the ability of optometrists employed by nonprofessional firms to practice under a trade name.

The employment restrictions usually provide that it is unprofessional conduct or an illegal practice for an optometrist to accept employment from an unlicensed person or firm. For example, the provision in the North Carolina statute reads: "[A]nd it shall be likewise unlawful for any corporation, lay body, organization, group, or lay individual to engage, or undertake to engage, in the practice of optometry through means of engaging the services, upon a salary or commission basis, of one licensed to practice optometry or medicine in any of its branches in this State. Likewise, it shall be unlawful for any optometrist licensed under the provisions of this Article to undertake to engage in the practices of optometry as a salaried or commissioned employee of any corporation, lay body, organization, group, or lay individual."[17]

Restrictions on location usually provide that it is unprofessional conduct or an illegal practice to work in an office not devoted exclusively to the practice of optometry or some other health care profession or in which materials are displayed pertaining to a commercial undertaking not related to the practice of optometry. For example, the provision in the South Carolina statute reads: "Any person registered as provided for in this chapter may have his certificate of registration revoked or suspended by the board for . . . [f]ailure to have their offices for the practice of optometry, . . . in offices separate and distinct from any business organization, with doors leading directly to the street, or public halls leading directly to the street. They shall not practice or operate in or on premises where any material other than those necessary to render their services are dispensed to the public."[18]

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 proportion of the time the office is open to the public. The California statute reads: "Nothing in this chapter shall prevent an optometrist from owning, maintaining or operating more than one branch office if he is in personal attendance at each of his offices fifty

[17] N.C. Admin. Code, § 90-125.

[18] S.C. Code Ann., No. 56-1077.

TABLE 2

COMMERCIAL PRACTICE RESTRICTIONS BY STATE, 1980

State	Employment Restriction	Location Restriction	Branch Office Restriction	Trade Name Restriction
Alabama	S*	...	S	S
Alaska	R	R	S, R	R
Arizona	R	...	R	R, S*
Arkansas	S	...	...	...
California	S	...	S	R, S*
Colorado	S	R	...	R
Connecticut	S	S	R	...
Delaware	S, R	S, R	...	R
District of Columbia	...	...	...	...
Florida	S, R	R	R	S, R
Georgia	...	R	R, C	R
Hawaii	S	S	...	S
Idaho	S, R	R	R	R, S*
Illinois	...	...	...	S
Indiana	S	...	...	R
Iowa	C	...	...	S*
Kansas	S, R, C	...	...	S, R
Kentucky	R, C	...	S, R	S
Louisiana	C	...	...	...
Maine	S	S	S	S
Maryland	S*	...	...	...
Massachusetts	S	R	R, A	S, R
Michigan	S*	...	...	R
Minnesota	A, S*	...	...	...
Mississippi	R, C, A	R	R	R
Missouri	...	R	...	S
Montana	S	R	...	R, S*
Nebraska	...	...	...	...
Nevada	S	S, R	...	R
New Hampshire	S	R	...	...
New Jersey	S, R	S	C	S
New Mexico	S*	...	...	S
New York	C	...	...	R
North Carolina	S	R	R	S
North Dakota	S	...	...	R
Ohio	R, C	...	A	R
Oklahoma	S	S, R	R	S
Oregon	...	...	R	S*
Pennsylvania	R	R	R, S*	R
Rhode Island	S	S	...	S, R
South Carolina	...	S, R	R	S, R
South Dakota	S, S*	R	...	S, R
Tennessee	S	S	S	S
Texas	S*	S	S	S
Utah	C	R	...	S
Vermont	A	...	S	R, S*
Virginia	S, R	S	...	S, R
Washington	C	R	...	S*
West Virginia	R, S	S	...	S, R
Wisconsin	S*	...	...	...
Wyoming	S*	...	...	...

SOURCE.—Federal Trade Commission, State Restrictions on Vision Care Providers: The Effects on Consumers ("Eyeglasses II") 28 (July 1980).

NOTE.—C = court decision, S = statutory restriction, S* = ambiguous statute, A = attorney general opinion, and R = state board regulation.

percent (50%) of the time during which such office is open for the practice of optometry."[19]

Trade name restrictions usually provide that an optometrist's license to practice may be revoked or suspended for practicing under a name other than his or her own name or under a false or assumed name. However, trade name restrictions

> generally do *not* prevent an optometrist from working for another optometrist and holding him or herself out under the name of the professional corporation. Thus, these restrictions have a distinct discriminatory impact on non-professional corporations. (The discriminatory impact here is not that a professional corporation is able to use a traditional trade name but rather that an individual optometrist can hold him or herself out under a firm name which does not contain his or her individual name so long as that firm is a professional corporation or the name of a licensed optometrist who employs that individual optometrist.)[20]

The existence of commercial practice restrictions in the market for ophthalmic services is consistent with the economic theory of regulation and with recent literature on strategic use of the regulatory process by subgroups of firms within an industry. According to the economic theory of regulation, regulation can be used as a device for transferring income from groups with less political power to groups with more, usually from consumers to the politically powerful regulated industry.[21] Firms in the regulated industry are assumed to be homogeneous and therefore equally benefited by the regulation and equally interested in promoting the regulation.

Recently, the economic theory of regulation has been extended to include heterogeneous firms and thus the idea that regulations impose different benefits and costs on firms within the industry.[22] Assuming that heterogeneous firms form subgroups,[23] regulation can be viewed as a

[19] Cal. [Bus. & Prof.] Code § 3007(i) (Deering).

[20] Federal Trade Commission, *supra* note 3, at 23–24.

[21] See Sam Peltzman, Toward a More General Theory of Regulation, 19 J. Law & Econ. 211 (1976); Richard A. Posner, Theories of Economic Regulation, 5 Bell J. Econ. & Mgmt. Sci. 335 (1974); and George J. Stigler, The Theory of Economic Regulation, 2 Bell J. Econ. & Mgmt. Sci. 3 (1971).

[22] See Michael T. Maloney & Robert E. McCormick, A Positive Theory of Environmental Quality Regulation, 25 J. Law & Econ. 99 (1982); Sharon Oster, The Strategic Use of Regulatory Investment by Industry Sub-groups, 20 Econ. Inquiry 604 (1982); and Steven C. Salop & David T. Scheffman, Raising Rivals' Costs, 73 Am. Econ. Rev. 267 (1983).

[23] See Richard E. Caves & Michael E. Porter, From Entry Barriers to Mobility Barriers: Conjectural Decisions and Contrived Deterrence to New Competition, 91 Q. J. Econ. 421 (1977); Howard H. Newman, Strategic Groups and the Structure-Performance Relationship, 60 Rev. Econ. & Stat. 417 (1978); and Michael E. Porter, The Structure within Industries and Companies' Performance, 61 Rev. Econ. & Stat. 214 (1979).

device for transferring income from subgroups of firms with less political power to those with more. Politically powerful firms can use the regulatory process as a strategic weapon against other groups of firms within the industry. Oster wrote, "As long as there is some initial difference among firms in an industry, different firms in that industry may push for regulations which increase the relative rate of return to their peculiar characteristics. . . . [T]he firm may even encourage a regulation which lowers its short-term profits if that regulation simultaneously reduces the ability of its rival to compete effectively."[24]

Salop and Scheffman make a more general argument and mention regulation as one way to increase rivals' costs: "It is better to compete against high-cost firms than low-cost ones. Thus, raising rivals' costs can be profitable even if the rival does not exit from the market. . . . A higher-cost rival quickly reduces output, allowing the predator to immediately raise price or market share."[25]

Strategic use of the regulatory process is quite possible in the ophthalmic industry. Optometrists regulate themselves,[26] and the optometrists appointed to the state regulatory boards are not appointed at random. Board members in forty-six states are appointed by the governor from lists of optometrists who have practiced optometry in the state for a specified number of years. In sixteen states, the optometry statutes designate membership in the state optometric association as a prerequisite for appointment, or they require the governor to make appointments from lists submitted by the state optometric association.[27] Further, the industry consists of differentiated subgroups of firms. Size, marketing strategy, and level of vertical integration differentiate self-employed optometrists from lay-employed optometrists.

IV. The Economic Effect of Commercial Practice Restrictions

The employment restriction prevents nonprofessional optical firms from employing optometrists and therefore from selling eye examinations and eyeglass prescriptions (that is, offering the one-stop service of dis-

[24] Oster, *supra* note 22, at 606.

[25] Salop & Scheffman, *supra* note 22, at 267.

[26] The state optometric boards are composed entirely of optometrists in twenty-six states and the District of Columbia: twelve states require only one lay member, eleven states require only two lay members, and California requires three lay members on the board. Council of State Governments, Health Licensure Boards: Public Membership (1981), at table 1.

[27] Federal Trade Commission, Staff Report on Advertising of Ophthalmic Goods and Services and Proposed Trade Regulation Rule (16 CFR Part 456) 34–35 (May 1977).

pensing optometrists). To the extent that there are economies of scope in the joint production of eye examinations and eyeglasses, the employment restriction forces nonprofessional optical firms to incur the higher cost of producing eyeglasses alone. Thus the employment restriction may deter entry by potential nonprofessional optical firms. However, the employment restriction does not prevent the nonprofessional firm from locating close to an optometrist.

The trade name restriction prevents lay-employed optometrists from including trade names in their advertising. Since consumers can use trade names as a substitute for search or as an aid in processing information about different sellers, the trade name restriction decreases the effectiveness of advertising by nonprofessional optical firms. This may reduce the ability of nonprofessional optical firms to attract new customers and realize scale economies. Like the employment restriction, the trade name restriction may also deter entry by potential nonprofessional optical firms.

The location restriction prevents self-employed and lay-employed optometrists from locating in high-traffic, high-visibility areas such as shopping centers and department stores. This reduces the ability of all optometrists to develop high-volume practices and realize economies of scale. Lay-employed optometrists, however, tend to rely more heavily than self-employed optometrists on convenient locations to attract customers.[28] Therefore, lay-employed optometrists are more likely to be constrained by the location restriction.

The branch office restriction prevents self-employed and lay-employed optometrists from expanding their practices by opening new offices. To the extent the branch office regulation is binding, optometrists are prevented from utilizing the cost-minimizing combination of inputs. With data from the dental industry, DeVany, Gramm, Saving, and Smithson[29] show that input regulation increases the ratio of unrestricted to restricted inputs.

The preceding discussion focuses on the commercial practice restrictions' effects on self- and lay-employed optometrists' production costs. Two of the four restrictions, the employment and trade name restrictions, may increase the costs of production for lay-employed optometrists. The

[28] Support for this suggestion is found in the Prospectus of Pearle Health Services, Inc. "They [retail stores] are generally located in high traffic areas convenient to customers, typically in shopping malls, strip shopping centers or freestanding buildings in major shopping areas." Pearle Health Services, Inc., *supra* note 11 at 11.

[29] Arthur S. DeVany, Wendy L. Gramm, Thomas R. Saving, & Charles W. Smithson, The Impact of Input Regulation: The Case of the U.S. Dental Industry, 25 J. Law & Econ. 367 (1982).

location and branch office restrictions may increase the costs of production for self-employed and lay-employed optometrists; however, it can be argued that the location and branch office restrictions differentially damage lay-employed optometrists. In addition, the analysis suggests that the restrictions may deter entry by nonprofessional optical firms.[30] The expected result, if this is true, is higher prices.

The hypothesis to be tested, then, is that the commercial practice restrictions have tended to increase eye examination and eyeglass prices. However, the major justification for the restrictions is elimination of low-quality services. Accordingly, the empirical analysis also examines the effect of the restrictions on quality. A hedonic regression is estimated to test the effects of the restrictions on quality-adjusted price. The quality-adjusted price is defined as the price of an eye examination and pair of eyeglasses of a given quality and is revealed to consumers from observed prices of eye examinations and eyeglasses and the level of quality associated with them.

V. The Model

When information is costly, the relevant market structure is monopolistic competition rather than perfect competition.[31] Accordingly, the ophthalmic industry is modeled as a monopolistically competitive industry.[32]

Assuming optometrists choose price and quality jointly, the quality-adjusted price, $QUALP_j$, charged by optometrist j is a function of optometrist j's marginal cost, MC_j, and price elasticity of demand, e_j:

$$QUALP_j = f[MC_j(INPUT, R\text{-}EMPLOY, R\text{-}LOCATE, R\text{-}BRANCH, R\text{-}TN), e_j(A_j, AD, OPTOM)], \quad (1)$$

where INPUT is the price of inputs, R-EMPLOY is the employment restriction, R-LOCATE is the location restriction, R-BRANCH is the branch office restriction, R-TN is the trade name restriction, A_j is the

[30] Support for this suggestion is found in the Prospectus of Pearle Health Services, Inc. "Management believes that these efforts [Federal Trade Commission proceedings that may result in rules that would preempt restrictions], if successful, would facilitate increased market penetration by the Company in those jurisdictions." Pearle Health Services, Inc., *supra* note 11, at 16.

[31] See Steven Salop, Information and Monopolistic Competition, 66 Am. Econ. Rev. 240 (1976).

[32] See also Mark V. Pauly & Mark A. Satterthwaite, The Pricing of Primary Care Physicians' Services: A Test of the Role of Consumer Information, 12 Bell J. Econ. 488 (1981). Pauly and Satterthwaite classify the market for primary medical care as monopolistically competitive "because physicians are price setters and metropolitan areas contain sufficient numbers of competitive physicians to eliminate oligopolistic interactions." *Id.* at 489.

level of advertising chosen by optometrist j, AD is competitors' advertising expenditures, and OPTOM is the number of optometrists in the market area. As discussed earlier, R-EMPLOY and R-TN may increase costs for lay-employed optometrists, and R-LOCATE and R-BRANCH may increase costs for self- and lay-employed optometrists. The price elasticity of demand depends on the number of sellers[33] and the level of advertising.[34] Further, it is expected that $\delta QUALP_j/\delta MC_j > 0$, $\delta QUALP_j/\delta e_j < 0$, and $\delta MC_j/\delta INPUT > 0$.

Not all optometrists decide to advertise. The advertising choice of optometrist j is assumed to be a function of $QUALP_j$,[35] competitors' advertising expenditures,[36] and the trade name restriction:

$$A_j = g(QUALP_j, AD, R\text{-}TN). \tag{2}$$

The signs of all three variables are ambiguous. For example, R-TN makes advertising by lay-employed optometrists less effective. As a result, the lay-employed optometrist may decide to advertise less or may decide to advertise more to compensate for less-effective advertising messages.

Professionals' location decisions depend on demand for their services, measured as per capita income,[37] state licensure requirements,[38] the supply of competing professionals,[39] and the regulatory environment.[40] Accordingly, it is assumed that the number of self- and lay-employed optometrists is a function of per capita income, Y, the difficulty of the state licensing examination, EXAM, the supply of opticians, OPTIC, and the four commercial practice restrictions:

$$\begin{aligned} OPTOM = b(&Y, EXAM, OPTIC, R\text{-}EMPLOY, \\ &R\text{-}LOCATE, R\text{-}BRANCH, R\text{-}TN). \end{aligned} \tag{3}$$

[33] Pauly & Satterthwaite, *supra* note 32.

[34] See, for example, Phillip Nelson, Advertising as Information, 81 J. Pol. Econ. 729 (1974).

[35] See, for example, Richard E. Kihlstrom & Michael H. Riordan, Advertising as a Signal, 92 J. Pol. Econ. 427 (1984); and Nelson, *supra* note 34.

[36] See Michael Waterson, Economic Theory of Industry 131 (1984).

[37] See, for example, L. Benham, A. Maurizi, & M. W. Reder, Migration, Location and Remuneration of Medical Personnel: Physicians and Dentists, 50 Rev. Econ. & Stat. 332 (1968); and Alfred Meltzer, Kathryn Langwell, Michael Keane, & Shelly Nelson, Report on the Geographic Distribution of Vision Care Providers (unpublished report, Applied Management Sciences, Inc., 1983).

[38] See, for example, Benham, Maurizi, & Reder, *supra* note 37; and H. E. Frech III, Occupational Licensure and Health Care Productivity: The Issues and the Literature, in Health Manpower and Productivity: The Literature and Required Future Research (John Rafferty ed. 1974).

[39] See, for example, Meltzer, Langwell, Keane, & Nelson, *supra* note 37.

[40] See, for example, *id.*

It is expected that $\delta OPTOM/\delta Y > 0$, $\delta OPTOM/\delta OPTIC < 0$, and $\delta OPTOM/\delta EXAM < 0$. As discussed earlier, R-EMPLOY and R-TN may deter entry by lay-employed optometrists, and R-LOCATE and R-BRANCH may deter entry by self- and lay-employed optometrists.

From equations (1), (2) and (3), quality-adjusted price, advertising, and number of optometrists are simultaneously determined by AD and eight exogenous variables.[41] Competitors' advertising expenditures are endogenous, so an instrumental variable, the presence or absence of media advertising by optometrists in the market, ADVERT, is used in the estimation of equation (4). The state commercial practice restrictions may affect the level of optometrists' advertising expenditures but not whether optometrists choose to advertise in that state. The 1977 Supreme Court ruling in *Bates v. State Bar of Arizona* allows professionals, regardless of their state's statutes, to advertise.[42] Accordingly, the effects of the commercial practice restrictions on quality-adjusted price are estimated using the following equation:

$$\begin{aligned} QUALP_j = h(&ADVERT, R\text{-}EMPLOY, R\text{-}LOCATE, \\ &R\text{-}BRANCH, R\text{-}TN, EXAM, OPTIC, \\ &Y, INPUT). \end{aligned} \tag{4}$$

VI. The Data

The data sources and the means and standard deviations of the variables are listed in Table 3. Data on the price, quality, and advertising of ophthalmic goods and services were derived from an FTC data set, which includes data on the price and quality of eye examinations and eyeglasses purchased from 280 optometrists in twelve Standard Metropolitan Statistical Areas (SMSAs).[43] To collect the data the FTC trained nineteen professional survey interviewers to identify the procedures and equipment used in eye examinations[44] and then sent the interviewers to optometrists'

[41] The state commercial practice restrictions may also be endogenous. For a detailed discussion, see J. Begun, E. Crowe, & R. Feldman, Occupational Regulation in the States: A Causal Model, 6 J. Health Pol., Pol'y, & L. 229 (1981). Endogeneity of the restrictions, however, will entail only a small bias in the ordinary least squares estimators if the variance of the errors is small relative to the variance of the regulatory variables. See, for example, G. S. Maddala, Econometrics 153 (1977).

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

[43] Baltimore; Columbia, South Carolina; Columbus, Ohio; Greensboro–Highpoint–Winston-Salem, North Carolina; Knoxville, Tennessee; Little Rock, Arkansas; Milwaukee; Minneapolis–St. Paul; Portland, Oregon; Providence, Rhode Island; Seattle; and Washington, D.C.

[44] During the training period, the interviewers were also given eye examinations so there would be independent opinions regarding the corrective lenses each subject required for proper vision.

TABLE 3

MEANS AND STANDARD DEVIATIONS OF VARIABLES

Variable	Definition	Mean	Standard Deviation
PRICE	Price of exam and glasses	79.58	13.51
THOROUGH	Thoroughness of exam	57.56	20.96
ACPRESC	Accuracy of prescription	.83	.37
ADVERT	Media advertising observed	.78	.41
R-TN	Trade name restriction	.52	.50
R-LOCATE	Location restriction	.38	.49
R-BRANCH	Branch office restriction	.27	.45
R-EMPLOY	Employment restriction	.52	.50
EXAM	Subjects in licensing exam	10.53	4.05
OPTIC	Optician/population ratio	7.12	4.42
Y	Per capita income	8438.78	992.28
INPUT	Hourly wage rate—manufacturing	4.06	.64

SOURCES.—P, THOROUGH, ACPRESC, and ADVERT computed from data provided by Federal Trade Commission, Effects of Restrictions on Advertising and Commercial Practice in the Professions: The Case of Optometry (September 1980); R-TN, R-LOCATE, R-BRANCH, and R-EMPLOY compiled from data in Federal Trade Commission, State Restrictions on Vision Care Providers: The Effects on Consumers ("Eyeglasses II") 28 (July 1980); EXAM compiled from data in U.S. Department of Health, Education, and Welfare, Report to the Congress: Reimbursement under Part B of Medicare for Certain Services Provided by Optometrists (July 1976); OPTIC from U.S. Department of Health, Education, and Welfare, Opticians Employed in the Health Services, U.S., 1968 (1968); *Y* from U.S. Department of Commerce, Bureau of Economic Analysis, Survey of Current Business (April 1981); and INPUT from U.S. Department of Commerce, Bureau of the Census, State and Metropolitan Area Data Book (1979).

offices to purchase examinations and eyeglasses in November and December 1977. The interviewers purchased the eye examinations and eyeglasses from 189 self-employed optometrists and ninety-one optometrists employed by drug and department stores and other nonprofessional optical firms.

Local newspapers were scanned from May 1977 to December 1977 to determine the extent of media advertising of eye examinations and eyeglasses in the twelve SMSAs.[45] Media advertising was observed in nine of the twelve SMSAs. Optometrists were observed advertising on-site with either large signs or window displays in all twelve SMSAs.

Price is measured as the sum of the price of an eye examination and the price of a pair of eyeglasses. The joint price is used because, when the

[45] There was no media advertising observed in Knoxville, Tennessee, Little Rock, Arkansas, and Providence, Rhode Island.

exam and glasses are purchased as a package, it is possible that the itemization of charges is arbitrary.

Quality is measured as the thoroughness of eye examination, THOROUGH, and as the accuracy of the eyeglass prescription, ACPRESC. Thoroughness of the eye examination is an index that measures inputs (procedures performed in the examination) rather than outputs (the optometrist's ability to discover all relevant information about the consumer's eye health). The index, developed by Dr. Kenneth Myers (Director of the Optometric Service, Department of Medicine and Surgery, U.S. Veterans Administration), was constructed by weighting each test or procedure by a value proportional to its importance in the examination.

Accuracy of the prescription is a measure of the clinical judgment of consultants at the State University of New York, College of Optometry, and at the Pennsylvania College of Optometry as to the appropriateness of the prescriptions. The consultants compared their opinions regarding the corrective lenses each subject required for proper vision with the written prescriptions from optometrists and then evaluated the prescriptions for the adequacy with which subjects' visual needs were met.

With respect to the other independent variables, EXAM is measured as the number of subject areas that must be included in the state licensing examination, INPUT is measured as the average SMSA wage rate of production workers in the manufacturing sector, and OPTIC is measured as the ratio of opticians to 100,000 population in the state.

VII. The Empirical Results

Equation (4) is estimated in double-log form using two specifications and two dependent variables. The results of regressions on price are reported in Table 4, while the results of regressions on quality are reported in Table 5. In the first specification the four 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 the restrictions are included as dummy variables, and an index of the degree of state regulation of optometry, REG, is interacted with quality and media advertising. The variable REG is constructed by summing the dummy commercial practice restriction variables by state. This summated scale assigns equal weight to each restriction and ranges from zero to four. Thus the potential interaction between quality choice and the restrictions and the interaction between media advertising and regulatory effect are included in the second specification.[46]

[46] Advertising may permit the realization of production scale economies that might otherwise be unobtainable because of market imperfections or regulation.

TABLE 4

REGRESSIONS ON PRICE, HOLDING QUALITY CONSTANT

Independent Variable	A*	B†	C‡	D*	E‡
CONSTANT	−1.4413	−.9728	−13.8777	−1.4378	−14.1398
	(.98)	(.62)	(3.45)	(.98)	(3.51)
INPUT	.8082	.9557	.7107	.8117	.7130
	(2.51)	(2.79)	(2.23)	(2.52)	(2.24)
Y	.4888	.4123	1.8315	.4767	1.8453
	(2.88)	(2.26)	(4.18)	(2.80)	(4.21)
OPTIC	−.1878	−.1814	−.5065	−.1863	−.5116
	(6.02)	(5.54)	(5.02)	(5.96)	(5.06)
EXAM	.1805	.1719	.3617	.1807	.3659
	(4.80)	(4.21)	(5.48)	(4.80)	(5.54)
ADVERT	−.3038	−.3305	.3883	−.3046	.4022
	(2.59)	(2.65)	(1.63)	(2.59)	(1.68)
R-TN	.0607	.0182	.4362	.1181	.5153
	(.48)	(.14)	(2.59)	(.83)	(2.82)
R-LOCATE	−.0015	.0277	.0860	.0536	.1561
	(.01)	(.24)	(.80)	(.43)	(1.25)
R-BRANCH	.1545	.2177	.5687	.2080	.6621
	(1.13)	(1.50)	(3.14)	(1.39)	(3.33)
R-EMPLOY	−.1592	−.1330	.1624	−.1072	.2337
	(4.83)	(3.62)	(1.59)	(1.59)	(1.94)
THOROUGH	.1110	.1163	.1064	.1358	.1370
	(4.59)	(4.40)	(4.47)	(3.67)	(3.77)
ACPRESC	...	.0070	...	...	...
		(.24)			
REG × ADVERT	...	...	−.3830	...	−.3912
			(3.31)		(3.38)
REG × THOROUGH	...	...	...	−.0139	−.0172
				(.88)	(1.11)

NOTE.—*t*-statistics are in parentheses.
* $N = 280$, $R^2 = .23$.
† $N = 253$, $R^2 = .23$.
‡ $N = 280$, $R^2 = .26$.

Because of the collinearity among the commercial practice restrictions,[47] the individual coefficients cannot be estimated precisely; however, the sum of the coefficients on the regulatory variables can be estimated with considerable accuracy. This sum provides a reliable estimate of the regulatory effect.[48]

[47] High zero-order correlations are a sufficient but not a necessary condition for the existence of multicollinearity. The trade name restriction is highly correlated with the location, the branch office, and the employment restrictions ($r = 0.82$, 0.52, and 0.54, respectively).

[48] See Maddala, *supra* note 41, at 189.

TABLE 5

REGRESSIONS ON QUALITY

Independent Variable	(1)*	(2)*
CONSTANT	2.9616	−7.3147
	(.93)	(.83)
INPUT	.1384	−.0037
	(.24)	(.01)
Y	.1401	1.2572
	(.38)	(1.30)
OPTIC	−.1325	−.3848
	(1.93)	(1.81)
EXAM	.0513	.2000
	(.63)	(1.39)
ADVERT	−.2702	.2865
	(1.26)	(.58)
R-TN	−.1656	.1684
	(.67)	(.46)
R-LOCATE	−.0509	−.0031
	(.25)	(.01)
R-BRANCH	.0640	.3900
	(.25)	(1.08)
R-EMPLOY	−.0254	.2143
	(.39)	(1.06)
REG × ADVERT	...	−.3056
		(1.25)

NOTE.—t-statistics are in parentheses.
* $N = 434$, $R^2 = .05$.

Results of ordinary least squares regressions that test the effects of the restrictions on price, controlling for differences in quality, are reported in Table 4. The coefficients on the dummy variables can be interpreted as percentage changes and those on the other variables as elasticities. Regression A and regressions C–E include one measure of quality, THOROUGH, while regression B includes two quality measures, THOROUGH and ACPRESC. Further, regression C allows for an interaction between the degree of state regulation of optometry and media advertising by optometrists; regression D allows for an interaction between the degree of state regulation of optometry and optometrists' quality decisions; and regression E allows for both interactions.

The results are consistent with the hypothesis that state commercial practice restrictions increase the price of ophthalmic goods and services, holding quality constant. The sum of the coefficients on the regulatory variables in regression A suggests a positive 5.5 percent difference in the price of an eye examination and pair of eyeglasses in fully regulated versus nonregulated states. Similarly, the summed coefficients for regres-

sions B–E resulted in positive 13.1, 7.3, 5.1, and 7.0 percent differences, respectively, in fully regulated states. In all five regressions the hypothesis that the effect of the commercial practice regulations is equal to zero can be rejected at the 1 percent level of significance (F = 8.14, 7.52, 11.18, 8.33, and 11.50, respectively).

With respect to the relationship between price and quality, the price of an eye examination and a pair of eyeglasses increases with the thoroughness of the eye examination but not with the accuracy of the eyeglass prescription. A 1 percent increase in the thoroughness of the eye examination results in a 0.11–0.12 percent increase in the price of an eye examination and pair of eyeglasses. The coefficient on ACPRESC, however, is not significantly different from zero. This suggests that prices convey information on one aspect of product quality, thoroughness of the examination, but prices do not convey information on a second aspect of quality, prescription accuracy. A possible explanation of this is that consumers can assess thoroughness but not prescription accuracy.

In all five regressions media advertising by optometrists is associated with lower prices, controlling for quality differences. Prices are approximately 26.3–33.1 percent lower in markets in which price or nonprice media advertising by optometrists is observed. This is consistent with the FTC's finding that the average price charged for eyeglasses and eye examinations is $23.74 lower in markets in which price advertising and chain optical firms are observed.[49] The coefficient on the optician-to-population ratio is also negative and statistically significant in all regressions. Further, in all five regressions more rigorous licensing examinations, higher per capita income, and higher input costs are associated with higher prices, controlling for quality differences. For example, a 1 percent increase in the number of subject areas that must be covered in the state licensing examination results in a 0.17–0.37 percent increase in price.

Table 5 reports the results of ordinary least squares regressions that test the effects of the commercial practice restrictions on quality, measured as the thoroughness of the eye examination. The results suggest that quality is not affected by the presence of the commercial practice restrictions. In the first quality regression the sum of the coefficients of the commercial practice restrictions is −17.8 percent, which is not significantly different from zero at the 1 percent level (F = 2.04). The summed coefficients of the commercial practice restrictions in the second quality regression equal −14.6 percent, again not statistically significant at the 1 percent level (F = 2.29). The results do not support the argument made by propo-

[49] Federal Trade Commission, *supra* note 5, at 4.

nents of the commercial practice restrictions that the restrictions will increase the quality of ophthalmic services.

VIII. Conclusions

In 1977 the four commercial practice restrictions appear to have increased the price of an eye examination and pair of eyeglasses by at least 5–13 percent, holding quality constant, measured as the thoroughness of the eye examination and accuracy of the eyeglass prescription. And to reiterate, the commercial practice restrictions did not appear to increase the quality of ophthalmic services. These results provide support for the economic theory of regulation and for a recent extension of the economic theory of regulation, that subgroups of firms within an industry will use the regulatory process to increase their rivals' costs and, therefore, their own market power.

Consumers paid at least $4.7 million more for eye examinations and eyeglasses in 1977 because of the four commercial practice restrictions.[50] Further, part of this $4.7 million is a social cost rather than an income transfer. Regulation-induced inefficiencies in production account for some of the price increase. The four commercial practice restrictions may inhibit optometrists' potential to realize economies of scale, the employment restriction may inhibit nonprofessional optical firms' potential to realize economies of scope, and the branch office restriction may prevent optometrists from employing the cost-minimizing combination of inputs. Also the opportunity costs of resources used by optometrists to influence the political process to attain market power through commercial practice laws and regulations are social costs.[51]

This paper suggests that commercial practice restrictions in the ophthalmic market are not protecting the consumer. The commercial practice restrictions increase price and have a statistically insignificant effect on quality. Intervention strategies should correct the market failure without causing serious distortions that lead to even greater consumer injury.

[50] This estimate is based on the four restrictions increasing price by $19, each optometrist providing 1,422 eye examinations and pairs of eyeglasses a year, American Optometric Association News, August 1, 1981; 18,589 optometrists practicing in states with trade name restrictions, 10,844 optometrists practicing in states with branch office restrictions, 8,613 optometrists practicing in states with location restrictions, and 14,750 optometrists practicing in states with employment restrictions, letter from Farrell Aron, Director of Statistical Research, American Optometric Association, September 15, 1982.

[51] See Richard A. Posner, The Social Costs of Monopoly and Regulation, 83 J. Pol. Econ. 807 (1975).

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