MEDICAL LICENSING BOARD CHARACTERISTICS AND PHYSICIAN DISCIPLINE:
AN EMPIRICAL ANALYSIS

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NBER Working Paper No. 15140
July 2009
JEL No. I1,I18

ABSTRACT

This paper investigates the relationship between the characteristics of medical licensing boards and the frequency with which boards discipline physicians. Specifically, we take advantage of variation in the structure of medical licensing boards between 1993 and 2003 to determine the effect of organizational and budgetary independence, public oversight, and resource constraints on rates of physician discipline. We find that larger licensing boards, boards with more staff, and boards that are organizationally independent from state government discipline doctors more frequently. Public oversight and political control over board budgets do not appear to influence the extent to which medical licensing boards discipline doctors. These findings are broadly consistent with theories of regulatory behavior that emphasize the importance of bureaucratic autonomy for effective regulatory enforcement.

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I. Introduction

An understanding of the factors that influence the enforcement of laws and regulations is of clear importance for public policy. The effective design of new regulatory agencies and the fruitful reform of existing ones require an appreciation of the incentives and constraints that regulators face. While there is a small literature that investigates the determinants of regulatory enforcement (Weingast and Moran 1983; Weingast 1984; Moe 1985; Magat Krupnick and Harrington 1986; McCubbins, Noll, and Weingast 1987; Olson 1995, 1996a, 1996b) much work remains to be done. Most of these studies analyze a handful of federal (*i.e.* national) regulatory agencies (for instance, the Food and Drug Administration and the Environmental Protection Agency), making it difficult to generate broad generalizations, especially to state level regulatory agencies. In addition, because the focus is generally on national regulatory agencies, empirical identification of the factors that influence regulatory enforcement comes primarily from temporal changes in regulatory regime. Causal identification is hampered by the fact that there tend to be relatively few regime shifts over time, and by the possibility that temporal regime shifts are correlated with other factors that might also affect the degree of enforcement.

This study furthers our understanding of regulatory enforcement by analyzing the disciplinary behavior of medical licensing boards—the state-level organizations that are responsible for licensing physicians and policing physician conduct. Across states and over time, medical licensing boards vary in their composition, their size, the resources they possess, and the organizational and budgetary autonomy they enjoy from state governments. While a body of scholarship has investigated the effects of medical licensing boards on entry into the medical profession (Graddy and Nichol 1989; Svorny and Toma 1998), and another has examined the specific offenses for which medical boards punish doctors (Clay and

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Conatser 2003; Morrison and Morrison 2001; Dehlendorf and Wolfe 1998; and Morrison and Wickersham 1998; Grant and Alfred 2007), no recent work has analyzed how the structure of medical boards affects rates of physician discipline.[1] This is a significant omission because medical licensing boards, along with the tort system, play an important role in policing physician quality. Medical errors are a leading cause of death in America, and the evidence indicates that much medical malpractice is never litigated (Baker 2005).[2] Our analysis therefore sheds light on an aspect of medical regulation that may be increasingly important for health policy.[3]

We also generate new insights into the issue of regulatory capture. Among regulation scholars, it is widely believed that occupational licensing regulation represents the canonical example of capture of the regulatory apparatus by the industry being regulated (Stigler 1971; Kleiner 2000). Occupational licensing regulation serves as an entry barrier that potentially allows a profession to increase prices and profits, often with little offsetting improvement in the quality of professional services. Moreover, the enforcement of licensing laws is almost invariably left to the profession itself. Since "insiders" are given the authority to discipline physicians for unprofessional conduct, an effect of licensing may be the reduced incentive to punish bad behavior (Derbyshire 1983). Capture of the regulatory apparatus by the profession may therefore manifest itself in lower rates of physician discipline. Since medical licensing boards vary in the degree of independence they enjoy from political officials, as well as in the

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[1] Dolan and Urban (1983), to our knowledge, are the only scholars who have analyzed the relationship between medical board characteristics and physician discipline. However, the period they study (1960-1977), their identification strategy, and their measure of physician discipline differ from ours.
[2] An earlier Harvard study identified that one percent of all hospital discharges in 51 New York hospitals in 1984 were due to medical negligence. Fewer than two percent of these victims of negligence filed a malpractice claim and only about half them received some compensation (Localio *et. al*. 1991).
[3] A related literature examines the political economy of state insurance commissions, which also vary in structure and composition across time and space. See Meier (1988, 1991), Klein (1995), and Willenborg (2000).

extent of outside (*i.e.* non-physician) oversight, we test this implication of the regulatory capture hypothesis.

Finally, our study represents a methodological improvement over other empirical scholarship of regulatory enforcement behavior. We use the variation in medical board structure across space and time to identify the factors that influence the extent of regulatory enforcement. Specifically, we match information on the nature of medical licensing boards with data on how frequently doctors are disciplined by these boards to estimate the importance of board composition, budgetary and organizational independence, and overall resources in determining the degree of regulatory enforcement within a fixed-effect framework. The effect of board characteristics on the extent of enforcement is therefore identified from within-board variation in characteristics. This framework provides more compelling evidence of the causal effect of regulatory regime than existing scholarship that relies exclusively on temporal variation at the national level.

We discuss the evolution of state medical boards in Section II. In Section III we outline hypotheses that might explain medical board regulatory behavior. This is followed in Section IV by a description of the data that we use to estimate the relationship between medical board characteristics and the extent of physician discipline. We argue in this section that the distribution of medical board characteristics across states is sufficiently exogenous for us to use this variation to identify the effects of board characteristics on physician discipline. We then discuss the empirical methodology, our regression results, and some robustness checks in Section V. The empirical analysis is followed by a conclusion and a discussion of the broader implications of our findings.

II. Evolution of State Medical Boards

State medical boards were created to protect the public from physician incompetence, but for much of their history their primary role was limited to guarding entry into medical profession. Indeed, until the 1980s, medical boards seldom disciplined physicians. The American Medical Association (AMA) reported in 1961 that "disciplinary action by both medical societies and boards of medical examiners are inadequate," and that physician incompetence as well as ethical and legal violations needed to be examined carefully (quoted in Ameringer 1999, p. 2). According to studies by Robert Derbyshire, a former president of the Federation of State Medical Boards, state medical boards disciplined about 0.06 percent of all licensed physicians in any year during 1963-67; there was only a negligible increase in the number of physicians disciplined between 1968-72; and the rate of discipline was still a mere 0.14 percent in 1981 (Ameringer 1999, p. 2). Other studies (Dolan and Urban 1983) showed similar ineffectiveness of board activities on physician discipline during this period.

Organized medicine enjoyed its "Golden Age" during this immediate postwar period when physicians enjoyed high levels of prestige and influence. However, after lawsuits for medical malpractice became more common in 1970s, it became increasingly clear that physicians had failed to police and discipline their colleagues through inaction and silence (Ameringer 1999, p. 29). Additionally, beginning in the 1980s continuing in the 1990s, there were major changes in the organization and structure of health care that fundamentally altered the role of state medical boards. These changes included crises in the availability and affordability of medical malpractice insurance;[4] the rise of consumer groups' such as Public Citizen's Health Research; increasing media criticism of medical board performance; major restructuring in the delivery of health care through Health Maintenance Organizations

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[4] There have actually been two "crises" in medical malpractice insurance premiums, one in the early 1970s, and another in the late 1980s (Feldstein 2003). Malpractice insurance premiums have continued to increase since these crises; however, as a percentage of total health care expenditures, they have remained roughly constant.

(HMOs); and reforms that simplified the collection and dissemination of information on health care providers. State medical boards were compelled to evolve in response to these changes in the health care environment. They became better funded, obtained greater independence in controlling their resources, more capably staffed to investigate physician discipline cases, and began to incorporate non-physician members.(Ameringer 1999, p. 73). As a result, according to the Federation of State Medical Boards, rates of physician discipline increased eight-fold from the early 1980s to the mid-1990s (Ameringer 1999, p. 42).

In an effort to contain cost increases, managed care organizations emerged as dominant players in health care markets. By 1995, more than 80 percent of physicians were affiliated with managed care organizations. An important consequence of this change was that physicians became more accountable to the third-party payers of medical services under the system's cost-cutting incentives to limit access to medical care. Medical decisions were routinely scrutinized and reviewed by HMOs and insurers. In particular, utilization reviews, in which HMOs and insurers evaluated the necessity and appropriateness of medical care, became common practice. Concerns about the autonomy of medical decision-making and the reputation of the medical profession prompted physicians and state medical boards to challenge the authority of HMOs to review medical decisions. In response, managed care organizations argued that utilization reviews were a "business function," and that state insurance departments, not state medical boards, should have authority to investigate coverage decisions even though state medical boards were the only agencies with the expertise to investigate the quality of medical decisions (Ameringer, 1999, p. 117). In the nationally followed *Murphy* case, the courts decided in favor of the Arizona State Medical Board and ruled that the Arizona medical board had the authority to review HMO decisions (Ameringer, 1999, p. 118). Thus, the rise of HMOs led to a new relationship between state

medical boards, physicians, and state medical societies. The HMOs' emphasis on cost savings measures and "business like" decision-making refocused the attention of state medical boards, physicians and state medical societies on professionalism and professional autonomy in medical decision making (Ameringer 1999). Accordingly, the quality of medical decisions and the reputation of the medical profession emerged as paramount concerns of state medical boards.

III. Hypotheses about regulatory enforcement

Broadly speaking, the nature and extent of regulatory enforcement will depend on the incentives that regulators face, and the resources they possess. Other things equal, the degree of enforcement will be increasing in the resources regulators have at their disposal. Regulatory agencies with larger budgets or more personnel can enforce laws more rigorously than those that are more constrained. This prediction is shared by all theories of regulatory behavior.

Theories of regulatory behavior differ, however, along other dimensions. At a general level, we can divide these theories into principal-agent (PA) theories and bureaucratic-autonomy (BA) theories. PA-theories posit an agency relationship between politicians (*i.e.* legislators), who want policies that cater to the median voter in their districts (because politicians are re-election seekers), and regulators, who are utility maximizers (Weingast and Moran 1983; McCubbins, Noll and Weingast 1989). In this framework, politicians recognize that regulators have different objectives than they do, and that they cannot perfectly monitor regulators. Thus, politicians have an incentive to design an optimal contract with regulators that aligns the objectives of the regulator with their own. There are several mechanisms through which politicians can induce regulators to behave according to their wishes. One is

through control over agency budgets. The threat of budget cuts in response to "bad" behavior by the regulator and the potential for budgetary increases in response to "good" behavior may induce regulators to comply with politicians' desires. Another is through political or public oversight of the regulatory agency. If politicians or members of the public (who share politicians' preferences) can directly oversee the actions of the regulator, regulators are more likely to behave in ways that politicians prefer. In the context of medical licensing boards, greater political control over medical board budgets, and measures that increase political oversight of medical board behavior (such as reducing the organizational independence of the board from state government, as well as altering medical board composition to include more outside members) should increase the extent to which boards enforce standards and impose discipline on the medical profession.

BA-theories, on the other hand, highlight the important role that independence from political meddling has on the effectiveness of regulatory enforcement (Miller 2000; Carpenter 2001). Scholars in this vein argue that regulatory enforcement is likely to be more effective if regulators are granted greater independence from political influence. There are several reasons why independence may facilitate regulatory enforcement. First, effective enforcement of regulation may not always be in every politician's best interest. While some politicians may benefit from more strict enforcement of regulation, others may benefit from less strict enforcement. For instance, in the context of disciplinary actions taken by medical boards, politicians whose re-election campaigns receive significant contributions from organized medicine may desire weaker regulatory enforcement of medical practice legislation. Measures that insulate regulators from political influence therefore serve as devices that commit politicians not to intervene in the regulator process (Miller 2000). Second, regulatory officials, particularly in the context of medical regulation, are often

reputation maximizing "professionals" (Carpenter 2001, 2004; Law 2005; Tonon 2008). As professionals, they may be bound by a code of ethics and a selection mechanism that puts "doing the right thing" above other objectives. Enforcing regulation effectively may enhance their prestige and allow them to expand their budgets and authority. Freedom from political influence may, in turn, permit them the autonomy to enforce regulation more effectively. With respect to medical licensing boards, BA-theories posit that greater independence (organizational and budgetary) from political influence, as well as less political or public oversight of medical licensing boards should result in more effective enforcement. As discussed earlier, this concern for professional autonomy and the reputation of the medical profession may have become especially important as a result of the rise of managed care and increased public scrutiny of the medical profession. Thus, BA-theories and PA-theories generate different predictions regarding the relationship between organizational and budgetary autonomy and regulatory effectiveness.

III. Data

The data on physician discipline and medical board characteristics come from two sources: the Federation of State Medical Board's (FSMB) annual *Board Action Summary*, which provides information on the number and type of disciplinary actions taken by each medical board as well as data on the number of licensed physicians who are regulated by each board in each year from 1991-2003, and the FSMB's *Exchange* (Section 2), which publishes information on the characteristics of each medical board in selected years (1993, 1996, 1999, 2003).

Variable definitions

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Our primary dependent variable is the total number of disciplinary actions per 1,000 licensed physicians taken by each medical board in each year. We divide by the licensed physician population because the number of physicians regulated by each board varies significantly across boards. Total disciplinary actions equal the sum of licenses removed, licenses restricted, and other actions. In order to determine how board characteristics affect the nature of physician discipline, we also use licenses removed per 1,000 licensed physicians, licenses restricted per 1,000 licensed physicians, and other disciplinary actions per 1,000 licensed physicians as dependent variables.[5]

We construct a variety of variables to control for medical licensing board characteristics that might influence the degree and nature of physician discipline. PA and BA theories of regulatory behavior suggest that factors like the size of the medical board, the resources available to each board, the insider-outsider composition of each medical board, and the organizational and budgetary independence each board enjoys may influence disciplinary actions. Accordingly, we collected data on the number of board members per 1,000 licensed physician, the number of full time equivalent (FTE) staff members employed by each board per 1,000 licensed doctor, as well as information on whether board revenues are taxed by the state government to control for the resources available to each board to oversee the medical profession;[6] the share of outside (*i.e.* non-physician) members on each board to control for the degree of outside oversight over board behavior; and a measure of medical board independence to proxy for the extent to which the board is organizationally independent of the state government. According to the Federation of State Medical Boards, a

[5] The FSMB define these categories as follows. Loss of license: includes revocation, suspension, surrender, or mandatory retirement of license or loss of privileges afforded by that license. Restriction of license: includes probation, limitation, or restriction of license, or licensed privileges. Other disciplinary actions: includes modification of a physician's license, or the privileges granted by that license, that results in a penalty or reprimand do the physician.
[6] The FMBS *Exchange* does include some data on medical board budgets. Unfortunately, there were too many missing observations for us to use this data.

board is "independent" if it is fully empowered to made decisions regarding physician discipline without having to consult with other organs of state government. Independent boards exercise all licensing and disciplinary powers. "Semi-independent" boards are subject to some oversight by some other state government department (for instance, departments of health). "Advisory" boards, in contrast, exercise a purely advisory role to some central agency within state government. Finally we constructed a binary variable that indicates whether the board receives funding from the state government. This variable measures the budgetary control that legislators may have over the board.[7]

Because we only have data on board characteristics for four years, our panel consists of four cross-sections representing medical board actions and board characteristics in 1993, 1996, 1999 and 2003. Fourteen states have separate medical boards to regulate MD physicians and DO (osteopathic) physicians; in the remaining jurisdictions, the same medical licensing board regulates both types of physicians. Accordingly, the number of medical boards in our sample (65) exceeds the number of states plus the District of Columbia (51). Due to missing observations, we do not have a balanced panel.

Evolution of medical board characteristics, 1993-2003

Since our identification strategy exploits within-board variation to estimate the effects of board characteristics on rates of physician discipline, we present data on the distribution of board characteristics by year to illustrate how these characteristics evolve over the sample period. Table 1 displays data on medical board independence from 1993-2003. The columns in the table report the number of medical boards that fall into each category in a given year. While the number of purely advisory boards remains the same between 1993 and 2003, there

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[7] The FMBS *Exchange* also reports information on how board members are selected, whether boards were bifurcated by role, the length of board members' terms, how frequently the boards meet, and other characteristics. We did not collect data on these characteristics because they did not vary over time. The inclusion of board-specific fixed effects controls for the effect of these time invariant board characteristics on physician discipline.

is some movement between the independent category and semi-independent category, albeit with no apparent trend towards greater or lesser autonomy. Upon closer inspection of the data, we found that no board switched from one category to another more than once, and the four advisory boards were the same throughout this period. Accordingly, identification of the effects of board independence on physician discipline comes from boards that switch between independent and semi-independent status.

Information on the changing distribution of board size per 1,000 licensed physicians and FTE staff per 1,000 licensed doctors are shown in tables 2 and 3. Our measures of board size and board staff can change either because the number of board members or staff changes, or because the number of physicians regulated by the board changes. While the distribution of board size per 1,000 doctors appears to be relatively stable between 1993 and 2003, there is a trend towards more staff per 1,000 doctors: during this period the number of boards with fewer than one FTE staff member per 1,000 physicians declined from 14 to 6 while the number of boards with more than four FTE staff per 1,000 physicians increased from 8 to 13. The resources available to medical boards, in terms of personnel, have therefore expanded.

Table 4 presents information on the budgetary status of medical boards. Two trends are apparent from this table. First, there is a dramatic decline in the number of boards that receive state funds. Between 1993 and 2003, the number of medical boards that received funding from state governments fell from 19 to 11. Political control over medical board budgets therefore seems to have fallen over time. Second, the number of medical boards whose revenues are taxed by the state government increased from 13 to 22. These two trends are also correlated. As shown in Table 6, the correlation coefficient between the two dummy variables is -0.27, which indicates that boards that receive state funds are less likely to be

taxed by state governments. We offer two explanations for this correlation. The first is that political control over board budgets can be exercised either by subsidizing board expenditures or by imposing taxes on board revenues. The negative correlation between these two variables may be due to the fact that they are substitute mechanisms for exercising political control over regulators. A second, and, in our view, more likely explanation is that the decline in the number of boards receiving state funding and the increase in the number of boards that are taxed are driven by state-level fiscal needs. In response to growing fiscal imbalances, state governments respond by reducing expenditures on medical boards (*i.e.* requiring boards to be self-funded) and by expanding the tax base in search of greater revenues (*i.e.* imposing taxes on medical board revenues). These underlying fiscal trends are presumably uncorrelated with factors that influence trends in physician quality.

Table 5 reports information on the distribution of the share of outside (non-physician) membership on medical licensing boards. An inspection of this table reveals three important facts. First, no board had a majority of outside members.[8] Second, for the overwhelming majority of boards, the share of outside membership ranges between 10 and 30 percent. Third, the number of boards with no outside members fell from 6 in 1993 to 2 in 2003. Accordingly, there seems to be a trend toward greater outside participation on medical licensing boards.

Does variation in board characteristics permit causal inferences?

In order to make causal inferences about the relationship between board characteristics and physician discipline, we need to establish that board characteristics are

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[8] If medical board disciplinary decisions are made under a simple majority rule, then our data set would have insufficient variation along this dimension for us to assess whether outside membership influences the extent of physician discipline. While we do not have specific information on the decision rules used by medical boards to make decisions, our understanding is that near unanimity is usually required, which implies that outsiders may have real influence on board decisions, even if they are a minority.

exogenous with respect to other factors that might influence the quality of physicians and the demand for physician discipline across jurisdictions. While board characteristics are clearly not randomly distributed across jurisdictions, our belief is that these characteristics are sufficiently exogenous so as to allow us to make causal inferences from this variation. Two pieces of evidence support this perspective. First, as shown in Table 6, licensing board characteristics are only weakly correlated with each other across jurisdictions. While the size of the board is well correlated with the number of full time equivalent staff (correlation coefficient of 0.64), and, as noted earlier, boards that receive state funding are also less likely to be taxed by state governments (correlation coefficient of -0.27), none of the other characteristics is highly correlated with any of the others, in either a positive or negative direction. If, for instance, board characteristics that are associated with greater political control and oversight over board behavior were highly correlated with each other, we might be concerned that some omitted factor might be at play that would also be correlated with rates of physician discipline. The fact that few of these characteristics have any significant correlation with each other provides some evidence in favor of the view that the distribution of characteristics is exogenous, at least with respect to underlying preferences for physician discipline.

Second, we did not find any systematic relationships among factors that might be correlated with changes in physician discipline within a given jurisdiction and medical board characteristics. In order to rule out reverse-causality, we analyzed whether lagged changes in rates of physician discipline give rise to changes in medical board structure. In these models, we also included other variables to proxy for changes in health care environment as well as other changes in political sentiment or tastes within a jurisdiction that might influence the demand for physician discipline. These control variables include: changes in the Medicaid

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managed care share in each state, changes in real per capita personal income at the state level, changes in the state government's share of state GDP, changes in the Democratic vote share in the nearest Presidential election, and an indicator variable that equals 1 if the governor of the state is a Democrat and 0 otherwise. Ordinary least squares regression estimates of the effects of these variables on each licensing board characteristic are displayed in Table 7. While there is some evidence that states that experience faster per capita income growth have a smaller share of outsiders on the board, none of the other variables has a statistically significant relationship with any of the board characteristics. Board characteristics do not respond to past changes in state-level Medicaid managed cares shares, to past changes in rates of physician discipline, nor to changes in our various measures of political sentiment or state-level tastes that might also be correlated with increased stringency of regulatory enforcement.[9] Accordingly, we are quite confident that our empirical analysis of the effects of board characteristics on physician discipline will yield valid causal inferences.

IV. Empirical analysis

Our baseline regression for estimating the effect of medical board characteristics on the extent of physician discipline is as follows:

$$y_{ist} = \alpha + R_{ist}\beta + X_{st}\gamma + T_t + B_i + \varepsilon_{ist}$$

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[9] We also included state-level information on the growth rates of medical malpractice premiums between 1991 and 2001 in an unreported analysis, and found no significant correlations between premium growth rates and changes in medical board structure during this time. While the growth of medical malpractice premiums may have contributed to rising rates of physician discipline by medical boards (as has been suggested by the literature we surveyed earlier on the evolution of medical boards), they do not appear to have had an effect on board structure *per se*, at least during the period under analysis. Failure to control directly for medical malpractice premiums therefore should not bias our estimates of the effects of board structure on physician discipline, although it may reduce the fit of our model if concerns about medical malpractice induced medical boards, in general, to discipline doctors more carefully.

where y_{ist} is the number of disciplinary actions per 1,000 doctors taken by board i in state s in year t; R_{ist} is a vector of the characteristics of board i located in state s in year t; X_{st} is a vector of time varying state-level control variables; T_t and B_i are year and board fixed-effects, respectively; and ε_{ist} is an error term. Since this regression framework includes fixed-effects at the board and year level, identification of the effects of medical board characteristics on rates of physician discipline come from within-board changes in board characteristics over time. In other words, we estimate the effect of a given board characteristic on rates of physician discipline by comparing changes in rates of discipline across boards that experience a change in that characteristic with boards that do not experience changes in that characteristic. The coefficient estimates represented by the vector β are therefore estimates of the effects of board characteristics on rates of physician discipline. The inclusion of board and year fixed-effects allow us to control for time-invariant, jurisdiction-specific factors that might affect rates of physician discipline, as well as nation-wide factors that influence rates of physician discipline.

We estimate this regression equation by ordinary least squares using four different dependent variables: total disciplinary actions per 1,000 doctors, number of licenses removed per 1,000 doctors, number of licenses restricted per 1,000 doctors, and other actions per 1,000 doctors. The board characteristics (R_{ist}) that we control for measure: (i) the resources available to the board to enforce physician discipline (number of board members per 1,000 licensed physician, the number of full time equivalent staff members employed by each board per 1,000 licensed doctors, and an indicator variable that equals 1 if the board's revenues are taxed by the state government and 0 otherwise); (ii) the organizational and budgetary autonomy enjoyed by the board (an indicator that equals 1 if the board is classified as

independent and 0 otherwise;[10] and another indicator variable that equals 1 if the board receives state government funding and 0 otherwise); and (iii) the degree of outside oversight of the board (share of board members who are not physicians).

Both the PA and BA hypotheses indicate that greater board resources should increase rates of physician discipline, but these two hypotheses have different predictions regarding the effects of budgetary and organizational autonomy, and the degree of outside oversight on the extent of physician discipline. While the PA hypothesis argues that boards that enjoy less budgetary and organizational autonomy and that are subject to greater oversight should regulate the medical profession more strictly, the BA hypothesis argues the opposite. Finally, X_{st} includes a number of variables that capture state-specific, time varying factors that may influence the extent of physician discipline within each state (board reporting requirements and the Medicaid managed care share in each state, real per capita personal income, state government spending as a share of state GDP, a Democratic governor indicator variable, and the share of the popular vote that was Democratic in the nearest presidential election). We included Medicaid managed care share as a proxy for the growth of managed care at the state level in order to control for the possible influence of changes in the health care environment on board characteristics.[11] Data on the managed care share are taken from Currie and Fahr (2005). The board reporting requirements variable—a simple index that equals the number of organizations that must report violations to medical boards—controls for 1990s reforms to

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[10] Because identification of the effect of board independence comes entirely from switches between semi-independent and independent boards, we use a binary variable to measure the effect of organizational autonomy.

[11] The Medicaid managed care share is admittedly an imperfect proxy for the overall penetration of managed care at the state level. Unfortunately, we were unable to locate state-level data on overall managed care penetration rates for the earliest years of our sample.

make boards more accountable to the public.[12] The remaining variables control for state-level factors that might influence the level of regulatory stringency. Descriptive statistics for key regression variables are shown in Table 8.

For each of the four dependent variables, we estimate four regression models. The first is simply a pooled OLS regression that omits the year and board fixed effects. The second includes year effects but not board effects. The third includes board fixed effects but no year fixed effects. The fourth (the regression equation displayed above) includes both year and board effects. The last model is our preferred specification as it allows us to make more compelling casual inferences by controlling for unobserved heterogeneity across boards and over time. Nevertheless, it is informative to compare these estimates with those obtained using less structured specifications. First, the inclusion of year and board fixed effects consumes degrees of freedom. It is possible that the statistical significance of some variables may therefore disappear when fixed effects are included, not because they are unimportant, but rather, because there are not enough observations to identify an effect. This is a particular concern since the number of years included in our panel is small. Second, by comparing results obtained with and without fixed effects, we can see whether the failure to control for unobserved heterogeneity significantly biases our findings.

Regression results

Table 9 presents the regression results obtained when total disciplinary actions per 1,000 physicians is the dependent variable. In Tables 9 through 12 each column represents a separate regression. Column (1) shows the pooled regression results. The regression

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[12] The Federation of State Medical Board categorizes these organizations into sixteen different groups. The value of this index therefore ranges from 0 to 16. These data are taken from the semi-annual FSMB *Exchange*.

displayed in column (2) includes year fixed effect while the results shown in column (3) include only board fixed effects. Column (4) shows the estimates obtained when year and board fixed effects are included. In each regression, there is a positive and statistically significant relationship between medical board organizational independence and total disciplinary actions. As shown in column (4), the number of disciplinary actions per 1,000 doctors increases by 1.66 when medical boards become organizationally independent. This is an economically significant magnitude, representing an increase of 23.5 percent above the sample mean. The regressions also suggest that board resources influence the extent to which medical boards discipline doctors. The number of board members per 1,000 doctors and/or the number of full time equivalent staff members per 1,000 doctors has a positive and significant impact on total disciplinary actions per 1,000 doctors. Both of these effects are also economically significant. According to the estimates shown in column (4), a one unit increase in the number of board members per 1000 doctors increases the total number of disciplinary actions per 1000 doctors by 1.14 (14 percent above the sample mean) while a one unit increase in the number of full time equivalent staff per 1,000 doctors raises the total number of disciplinary actions per 1,000 doctors by 0.28 (4 percent above the sample mean). The coefficient estimates for these variables reported in column (4) are also larger in both size and significance. Finally, none of the other board characteristic controls has a statistically significant effect on total disciplinary actions, regardless of whether fixed effects are included. The lack of statistical significance found for most of our board characteristics covariates is therefore not attributable to a reduction in degrees of freedom brought about by the inclusion of board and year fixed effects. We also do not find a statistically significant effect of the Medicaid managed care share on disciplinary actions.[13] Reporting requirements

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[13] The statistical insignificance of the managed care variable does not necessarily suggest, contrary to

are marginally significant in regressions (1) and (2), but this effect disappears when board fixed effects are included.

Tables 10, 11 and 12 display comparable regression results obtained using licenses removed per 1,000 doctors, licenses restricted per 1,000 doctors, and other disciplinary actions per 1,000 doctors (respectively) as dependent variables. Glancing across the tables reveals the following pattern of results. First, at least one measure of board resources (either the number of board members per 1,000 doctors or the number of full time equivalent staff members per 1,000 doctors) generally has a positive and statistically significant effect on physician discipline. Larger and more statistically significant positive effects of board resources are found when both year and board fixed effects are included. Second, organizational autonomy has a significant impact on some but not all measures of physician discipline. Board organizational autonomy is positive and statistically significant when licenses restricted per 1,000 doctors is the dependent variable, but is not significant when the remaining two measures of physician discipline are used. Third, other board characteristics do not generally have a significant effect on any measure of physician discipline. Boards that receive funds from the state government do not discipline physicians more or less frequently than boards that enjoy greater budgetary autonomy. Additionally, boards that are taxed by state government do not discipline doctors differently than those that are not taxed. The degree of outside influence within the board also does not generally have a statistically significant relationship with different measures of physician discipline. In none of the year and board fixed effect regressions displayed in Tables 9-12 is the coefficient on the share of

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that the growth of managed care did not contribute to rising rates of physician discipline in general. Rather, it suggests that cross-state variation in the growth of managed care did not contributed to differences in physician discipline across jurisdictions. Additionally, it is possible that managed care reforms and other changes in the health care environment (rising malpractice premiums and increased scrutiny of the medical profession) may have already induced medical boards to discipline doctors more carefully by the time our data set begins.

outside members on the board statistically significant. This result is at odds with Dolan and Urban (1983), who, using data from 1960-1977, find that greater non-physician participation on medical boards increases the frequency with which physicians are disciplined.[14] Accordingly, it would appear that outside oversight and greater political control over medical board budgets are not associated with more frequent rates of physician discipline.

Taken as a whole, our regression results suggest the following broad conclusions. First, overall resources are a key determinant of the extent to which medical boards discipline doctors. Regardless of which measure of physician discipline used, larger medical boards and boards with more staff discipline doctors more frequently. This finding is consistent with both theories of regulatory enforcement behavior, which predict that the degree of enforcement should be increasing in the resources commanded by regulators.

Second, our results provide stronger support for bureaucratic autonomy theories of regulatory behavior than for principal agent theories. There is some evidence that more independent boards discipline doctors more frequently, at least for some measures of physician discipline. On the other hand, boards that are subject to greater outside participation, or greater political control over their budgets, do not discipline doctors more frequently. The failure to find evidence in favor of the principal agent view may reflect the fact that during the 1990s, changes in the health care environment (*i.e.* the rise of HMOs and

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[14] There are several reasons why Dolan and Urban's findings are different from ours. First, their analysis focuses on a much earlier time period. Dolan and Urban use data from organized medicine's "golden age," a period when physicians and medical boards were under little public scrutiny. In contrast, our data are from a later period, when changes in the health care environment had forced medical boards and the medical profession to become more accountable. Second, Dolan and Urban use a different dependent variable to measure physician discipline. Third, they use a different and somewhat arbitrarily constructed measure of non-physician participation on medical boards. Finally, because they do not use fixed-effects, their identification strategy is different. In regressions presented in first two columns of Table 12, we find positive and statistically significant effect of greater non-physician participation on the extent of physicians received other disciplinary actions when board fixed effects are not included. Accordingly, part of the difference may be attributable to a failure to control for unobserved heterogeneity at the board level.

increased public scrutiny of health care providers) compelled all medical boards to become more accountable to the public. In this setting, greater political control or political oversight may not have resulted in stricter physician discipline because physician regulators already had a strong incentive to police physician conduct.

Third, our results may shed some light on the issue of regulatory capture. Among regulation scholars, it is often argued that medical licensing boards, because they are generally physician-dominated, can be captured by the medical profession and operated in ways that increase physicians' welfare at the expense of the public. Capture of the medical board by the medical profession may manifest itself as reluctance on the part of physician-dominated boards to discipline doctors. One testable implication of the capture theory is that boards that are more physician-dominated should discipline doctors less frequently. Another is that boards that are more organizationally and financially independent should discipline doctors less frequently. The coefficient estimates displayed in Tables 9 through 12 do not support these hypotheses. Our preferred estimates suggest that the share of outside membership on the board has no statistically significant effect on the degree of physician discipline, regardless of which measure of physician discipline we use. Additionally, boards that receive state funds do not discipline physicians more frequently. Indeed, greater organizational autonomy, as noted earlier, is associated with higher, not lower, rates of physician discipline. Again, this result is consistent with our previous discussion of how fundamental changes in health care markets altered the role of state medical boards. While our managed care variable does not have a statistically significant effect on rates of physician discipline, the qualitative evidence indicates that concerns about professional autonomy, physician competence, and the reputation of the medical profession became important to medical boards during the 1990s. The evidence accumulated suggests that these implications

of the capture theory may not be well supported during this period, largely because changes in the health care environment forced medical boards to become more accountable in general.[15]

Robustness checks

We undertook a number of robustness checks to investigate the sensitivity of our findings. First, we re-estimated the board and year fixed-effect regressions including board specific trend terms. While the inclusion of board fixed effects controls for unobserved heterogeneity that is constant within a board, it does not account for unobserved heterogeneity that may be changing within a board over time. Accordingly, it is possible that the significant effects that we observe in our regressions are being driven by time-varying, unobserved heterogeneity within medical boards. One reasonably agnostic way to control for this possibility is to include board-specific trend terms. As shown in Table 13, a similar pattern of results is found when board-specific trends are included. Board organizational independence has a positive and significant effect on three of four measures of physician discipline, as does board size, while the remaining board characteristic variables are statistically insignificant. Accordingly, it would appear that our results are robust to the inclusion of board-specific trend terms.

Second, we re-estimated the regressions using a lagged value of each measure of physician discipline as the dependent variable. If the earlier regressions correctly identify the effect of current board characteristics on contemporaneous rates of physician discipline, current board characteristics should not affect past rates of physician discipline. Estimating the regressions using past rates of physician discipline as the dependent variable allow us to

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[15] Capture may still manifest itself, however, in excessively strict control over entry into the medical profession. This is evidenced, for instance, by the continued reluctance of the medical profession to recognize foreign credentials. Additionally, it is possible that capture resulted in low rates of physician discipline in earlier decades, when organized medicine was under far less public scrutiny.

rule out the possibility that there is some trend that is driving both board characteristics and physician discipline. In none of these regressions are the coefficients on the board characteristics variables statistically significant, which help establish that we have correctly identified the effect of board characteristics on rates of physician discipline.

Third, we incorporated non-linearity in the effects of board size and/or board staff by including squared terms for each of these variables. We included these terms to allow for economies of scale in enforcement. Qualitatively similar results were found when these additional variables were included.

Fourth, we re-estimated the regressions incorporating a first order serially correlated error structure (AR(1)) in a Prais-Winsten regression framework. The signs and statistical significance levels of the independent variables are robust to the inclusion of AR(1) error terms. Accordingly, our findings are not driven by the failure to account for serial correlation.

Fifth, we estimated the regressions using negative binomial regression techniques. In this framework, the dependent variable is the number of disciplinary actions of a given type (rather than the number of disciplinary actions per 1,000 physicians) and we control directly for total physician population as a regressor. The signs and significance levels of the right-hand-side variable were similar in these regressions. Total disciplinary actions and the number of licenses removed are positively related to board organizational independence. Additionally, all forms of physician discipline are increasing in board size and/or board staff. Accordingly, our findings are robust to this alternative estimation strategy. In addition, we re-estimated each of our regressions using natural logarithmic transformations of the dependent variables and found qualitatively similar results.

Finally, we restricted the sample by eliminating all licensing boards that only regulate DO physicians. DO licensing boards, because they regulate a smaller number of physicians,

may behave differently than other licensing boards. Including DO licensing boards in the sample may therefore introduce measurement error that biases our results. Again, we obtained qualitatively similar results when these boards were excluded from the sample. Based on all these robustness check results, we are confident that our results correctly identify the effects of board structure on physician discipline.

V. Conclusion and Discussion

In this study we take advantage of variation in the characteristics of medical boards across the United States to determine the effects of board characteristics on rates of physician discipline. This analysis allows us to shed some light on the empirical determinants of regulatory behavior and provides a test of different hypotheses about how regulators behavior in response to different constraints and incentives.

Our basic findings are threefold. First, the overall resources available to the regulator are a key factor determining the degree of physician discipline imposed by licensing boards. Larger medical licensing boards and boards with more staff support discipline doctors more frequently. Second, organizational autonomy from political influence also affects physician discipline. Licensing boards that are organizationally independent from state government discipline physicians more frequently. This finding is supportive of bureaucratic autonomy theories of regulatory behavior, which argue that freedom from political influence plays an important role in helping regulators enforce regulation more effectively. Finally, other factors such as how boards are funded and board composition do not affect rates of physician discipline. Taken together, these findings provide partial support for the bureaucratic autonomy approach to understanding regulatory behavior.

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Our results are broadly consistent with the view that changes in health care markets during the 1980s and 1990s have refocused the objectives of medical boards, physicians, and state medical societies. From the 1950s through late 1970s, when the medical profession enjoyed its "golden age" of power and prestige, there was little incentive for medical boards to discipline physician conduct. Accordingly, rates of physician discipline were low, and boards were primarily concerned with limiting entry into the medical profession and curtailing competition from other health care providers (*e.g.* chiropractors). However, as a result of the rise of managed care, increased public scrutiny and skepticism of the medical profession, the growth of medical malpractice suits, and other fundamental changes in the health care environment, medical boards *and* physician groups became more concerned with protecting the reputation of the medical profession and the quality of medical decisions. Accordingly, the medical establishment found it in its own self-interest to monitor doctors more carefully. Rates of physician discipline by medical boards therefore rose dramatically, especially among more independent boards and boards with greater resources to police physician conduct. From a public policy perspective, these findings suggest that reforms that increase the degree of political or public oversight of medical board decisions may not result in stricter regulatory enforcement of physician conduct. In an environment where the quality of medical decisions is under intense scrutiny from patients, insurers, and other health care providers, self-regulating professions like medicine already have a strong incentive to police their own members.

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Table 1. Medical board independence, 1993-2003.

	1993	1996	1999	2003
Number of "independent" boards	45	48	44	46
Number of "semi-independent" boards	14	13	17	15
Number of "advisory" boards	4	4	4	4
Total number of boards	63	65	65	65

Source: See text.

Table 2: Board size per 1,000 licensed physicians, 1993-2003

	1993	1996	1999	2003
Number of boards for which size < 0.5	5	6	6	8
Number of boards for which 0.5 < size < 1	11	10	9	8
Number of boards for which 1 < size < 1.5	9	7	12	9
Number of boards for which 1.5 < size < 2	7	9	7	7
Number of boards for which 2 < size < 4	12	10	11	11
Number of boards for which 4 < size < 6	7	7	5	6
Number of boards for which size > 6	11	14	14	12
Total number of boards	62	63	64	61

Source: See text. Calculations by authors.

Table 3. Full time equivalent (FTE) staff per 1,000 licensed physicians, 1993-2003.

	1993	1996	1999	2003
Number of boards for which FTE < 1	14	6	11	6
Number of boards for which 1 < FTE < 2	12	20	12	11
Number of boards for which 2 < FTE < 3	18	15	15	13
Number of boards for which 3 < FTE < 4	7	6	11	9
Number of boards for which FTE > 4	8	12	12	13
Total number of boards	59	59	61	52

Source: See text. Calculations by authors.

Table 4. Budgetary status of medical boards, 1993-2003

		1993	1996	1999	2003
Budgetary autonomy?					
	Boards that receive state funds (Yes = 1)	19	15	12	11
	Boards that are self-funded (No = 0)	46	50	53	54
	Total	65	65	65	65
State gov't taxes board revenues?					
	Boards that are taxed by state gov't (Yes = 1)	13	18	24	22
	Boards that are not taxed (No = 0)	52	47	41	43
	Total	65	65	65	65

Source: See text.

Table 5. Share of outside membership on medical licensing boards, 1993-2003.

	1993	1996	1999	2003
Number of boards for which share = 0.	6	4	3	2
Number of boards for which $0 <$ share ≤ 0.1	3	5	4	3
Number of boards for which $0.1 <$ share ≤ 0.2	26	21	21	21
Number of boards for which $0.2 <$ share ≤ 0.3	20	23	24	21
Number of boards for which $0.3 <$ share ≤ 0.4	7	11	11	14
Number of boards for which $0.4 <$ share ≤ 0.5	1	1	2	4
Number of boards for which share > 0.5	0	0	0	0
Total number of boards	63	65	65	65

Source: See text. Calculations by authors.

Table 6. Correlations among board characteristics

	Board independence	Board members per 1,000 doctors	Full time equivalent staff per 1,000 doctors	Share of outside members on board	Board receives state gov't funding	Board is taxed by state gov't
Board independence	1.0					
Board members per 1,000 doctors	-0.11	1.0				
Full time equivalent staff per 1,000 doctors	-0.09	0.64	1.0			
Share of outside members on board	0.01	0.17	-0.11	1.0		
Board receives state gov't funding	-0.18	-0.01	0.11	0.03	1.0	
Board is taxed by state gov't	0.05	0.05	0.00	0.08	-0.27	1.0

Source: See text. Calculations by authors.

Table 7. Correlates of board characteristics

	(1) Board independence	(2) Board members per 1,000 doctors	(3) Full time equivalent staff per 1,000 doctors	(4) Share of outside members on board	(5) Board receives state gov't funding	(6) Board is taxed by state gov't
Δ(Total disciplinary actions per 1,000 doctors)	-0.028 (0.04)	-3.10 (2.39)	-2.94 (2.29)	0.01 (0.01)	0.02 (0.03)	0.01 (0.04)
Δ(Real per capita income)	0.47 (1.44)	-6.47 (35.78)	9.75 (33.28)	-0.73** (0.34)	-0.30 (1.51)	1.38 (1.82)
Δ(State gov't spending share of state GDP)	-0.90 (0.59)	17.26 (17.24)	13.10 (19.19)	-0.19 (0.24)	-0.07 (0.64)	3.16 (0.95)
Δ(Managed care share)	-0.001 (0.08)	2.07 (2.67)	0.06 (0.06)	-0.04 (0.03)	0.01 (0.09)	-0.13 (0.12)
Δ(Democratic vote share)	-0.27 (0.18)	3.12 (5.87)	-4.57 (6.62)	-0.03 (0.06)	-0.13 (0.23)	0.42 (0.29)
Democratic governor indicator	-0.03 (0.05)	-2.74 (1.90)	-2.11 (1.61)	0.01 (0.01)	-0.03 (0.04)	0.09 (0.05)
N	239	236	229	239	239	239

Notes: Each column represents a separate regression. State-board and year fixed effects are included. Robust standard errors are reported in parentheses. * denotes statistical significance at the 10 percent level.

Table 8. Descriptive statistics

Variable	Mean (standard deviation)	N
Total disciplinary actions per 1,000 doctors	7.05 (5.90)	248
Licenses removed per 1,000 doctors	2.85 (2.58)	248
Licenses restricted per 1,000 doctors	2.24 (2.63)	248
Other disciplinary actions per 1,000 doctors	1.95 (2.39)	248
Board independence (independent = 1)	0.70 (0.46)	258
Board members per 1,000 doctors	5.83 (14.53)	250
Full time equivalent staff per 1,000 doctors	4.59 (13.16)	231
Share of outside members on board	0.22 (0.11)	258
Board receives funding from state gov't (yes = 1, no = 0)	0.22 (0.42)	260
Board is taxed by state gov't (yes = 1, no = 0)	0.30 (0.46)	260
Managed care share	0.46 (0.31)	260
Board reporting requirements (index from 0 to 16)	7.48 (3.99)	252

Sources: See text.

Table 9. Effects of medical board characteristics on total disciplinary actions per 1,000 physicians

	(1) Pooled OLS	(2) Year FE only	(3) Board FE only	(4) Year and Board FE
Board independence	1.86*** (0.71)	1.71** (0.71)	2.00* (1.06)	1.66* (0.90)
Board members per 1,000 doctors	0.24* (0.14)	0.24 (0.15)	1.10** (0.40)	1.14*** (0.36)
FTE per 1,000 doctors	0.11** (0.05)	0.11** (0.05)	0.26 (0.18)	0.28* (0.16)
Share of outside members on board	0.48 (3.06)	3.01 (3.51)	5.45 (5.78)	4.96 (5.56)
Board received gov't funding	-0.13 (0.76)	-0.03 (0.78)	-0.48 (1.33)	-0.06 (1.40)
Board is taxed by state government	1.16 (0.89)	1.17 (0.89)	-1.98 (1.38)	-2.13 (1.56)
Reporting requirements	0.22* (0.13)	0.21* (0.13)	0.01 (0.17)	-0.04 (0.19)
Managed care share	1.32 (1.43)	0.85 (1.64)	0.94 (1.51)	-1.16 (1.77)
Year FE	No	Yes	No	Yes
Board FE	No	No	Yes	Yes
N	229	229	229	229

Notes: Each column represents a separate regression. Robust standard errors are reported in parentheses. Other state-level covariates include real personal income per capita, state government spending as a share of state GDP, Democratic governor indicator variable, and the Democratic vote share in the nearest presidential election. *, ** and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Table 10. Effects of medical board characteristics on number of licenses removed per 1,000 physicians

	(1) Pooled OLS	(2) Year FE only	(3) Board FE only	(4) Year and Board FE
Board independence	0.60* (0.34)	0.40 (0.36)	0.67 (0.52)	0.52 (0.54)
Board members per 1,000 doctors	0.12* (0.07)	0.11 (0.07)	0.30** (0.12)	0.33*** (0.12)
FTE per 1,000 doctors	0.05* (0.03)	0.05* (0.03)	0.04 (0.06)	0.05 (0.06)
Share of outside members on board	-0.43 (1.34)	-0.06 (1.38)	1.48 (2.53)	1.27 (2.26)
Board received gov't funding	0.11 (0.42)	0.25 (0.43)	-0.76 (0.68)	-0.51 (0.72)
Board is taxed by state government	-0.27 (0.37)	-0.31 (0.37)	-0.97 (0.69)	-1.05 (0.78)
Reporting requirements	0.08 (0.05)	0.07 (0.05)	0.03 (0.07)	-0.001 (0.76)
Managed care share	0.53 (0.64)	-0.14 (0.68)	0.51 (0.69)	-0.66 (0.77)
Year FE	No	Yes	No	Yes
Board FE	No	No	Yes	Yes
N	229	229	229	229

Notes: Each column represents a separate regression. Robust standard errors are reported in parentheses. Other state-level covariates include real personal income per capita, state government spending as a share of state GDP, Democratic governor indicator variable, and the Democratic vote share in the nearest presidential election. *, ** and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Table 11. Effects of medical board characteristics on the number of licenses restricted per 1,000 physicians

	(1) Pooled OLS	(2) Year FE only	(3) Board FE only	(4) Year and Board FE
Board independence	0.82*** (0.28)	0.95*** (0.29)	0.93** (0.37)	0.81** (0.37)
Board members per 1,000 doctors	0.10 (0.07)	0.10 (0.07)	0.37** (0.18)	0.38** (0.17)
FTE per 1,000 doctors	0.03 (0.02)	0.03 (0.02)	0.07 (0.08)	0.09 (0.07)
Share of outside members on board	-0.83 (1.34)	-1.09 (1.36)	1.08 (1.94)	0.96 (1.96)
Board received gov't funding	-0.26 (0.34)	-0.33 (0.34)	-0.38 (0.52)	-0.27 (0.54)
Board is taxed by state government	0.62 (0.42)	0.67 (0.42)	-0.84 (0.61)	-0.94 (0.69)
Reporting requirements	0.07 (0.06)	0.07 (0.06)	0.08 (0.07)	0.05 (0.07)
Managed care share	0.79 (0.61)	1.17* (0.07)	0.37 (0.65)	-0.29 (0.74)
Year FE	No	Yes	No	Yes
Board FE	No	No	Yes	Yes
N	229	229	229	229

Notes: Each column represents a separate regression. Robust standard errors are reported in parentheses. Other state-level covariates include real personal income per capita, state government spending as a share of state GDP, Democratic governor indicator variable, and the Democratic vote share in the nearest presidential election. *, ** and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Table 12. Effects of medical board characteristics on other disciplinary actions per 1,000 physicians

	(1) Pooled OLS	(2) Year FE only	(3) Board FE only	(4) Year and Board FE
Board independence	0.43 (0.32)	0.34 (0.32)	0.40 (0.46)	0.32 (0.46)
Board members per 1,000 doctors	0.03 (0.03)	0.03 (0.03)	0.43** (0.21)	0.43** (0.22)
FTE per 1,000 doctors	0.03 (0.02)	0.03 (0.02)	0.14* (0.08)	0.15* (0.08)
Share of outside members on board	1.72 (1.14)	1.87 (1.22)	2.89 (2.54)	2.74 (2.59)
Board received gov't funding	0.01 (0.36)	0.05 (0.37)	0.65 (0.48)	0.72 (0.52)
Board is taxed by state government	-0.81** (0.40)	-0.81** (0.40)	-0.20 (0.34)	-0.16 (0.34)
Reporting requirements	0.07 (0.05)	0.07 (0.05)	-0.09 (0.07)	-0.09 (0.07)
Managed care share	-0.02 (0.68)	-0.21 (0.91)	-0.05 (0.52)	-0.24 (0.79)
Year FE	No	Yes	No	Yes
Board FE	No	No	Yes	Yes
N	229	229	229	229

Notes: Each column represents a separate regression. Robust standard errors are reported in parentheses. Other state-level covariates include real personal income per capita, state government spending as a share of state GDP, Democratic governor indicator variable, and the Democratic vote share in the nearest presidential election. *, ** and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Table 13. Including board specific trend terms

	(1) Total disciplinary actions per 1,000 doctors	(2) Licenses removed per 1,000 doctors	(3) Licenses restricted per 1,000 doctors	(4) Other disciplinary actions per 1,000 doctors
Board independence	3.65**	1.41*	1.21*	1.02*
	(1.67)	(0.75)	(0.64)	(0.58)
Board members per 1,000 doctors	1.64**	0.66**	0.56*	0.41
	(0.82)	(0.33)	(0.32)	(0.37)
Full time equivalent staff per 1,000 doctors	2.28	0.75	0.86	0.67
	(1.67)	(0.55)	(0.67)	(0.52)
Share of outside members on board	6.89	0.38	1.02	5.53
	(9.21)	(4.19)	(2.80)	(4.40)
Board receives state gov't funding	2.02*	1.01	0.29	0.70
	(1.11)	(0.72)	(0.48)	(0.66)
Board is taxed by state government	-0.73	-0.12	0.02	-0.67*
	(1.12)	(0.53)	(0.44)	(0.37)
Reporting requirements	0.31	0.19	0.15	-0.03
	(0.31)	(0.12)	(0.13)	(0.12)
Managed care share	0.45	-0.23	-0.05	0.27
	(1.83)	(0.79)	(0.75)	(0.93)
Year fixed effects	Yes	Yes	Yes	Yes
Board fixed effects	Yes	Yes	Yes	Yes
Board-specific trend	Yes	Yes	Yes	Yes
N	229	229	229	229

Notes: Each column represents a separate regression. Robust standard errors are reported in parentheses. Other state-level covariates include real personal income per capita, state government spending as a share of state GDP, Democratic governor indicator variable, and the Democratic vote share in the nearest presidential election. *, ** and *** denote statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively.