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Regulator performance, regulatory environment and outcomes: An examination of insurance regulator career incentives on state insurance markets

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Abstract

In this paper we test whether the past or future labor market choices of insurance commissioners provide incentives for regulators in states with price regulation to either favor or oppose the industry by allowing prices that differ significantly from what would otherwise be the competitive market outcome. Using biographical data on insurance regulators, economic and state specific market structure and regulatory variables, and state premium and loss data on the personal automobile insurance market, we find no evidence consumers in prior approval states paid significantly different “unit prices” for insurance than consumers in states that allow competitive market forces to determine equilibrium prices during the time period 1985–2002. We do, however, find evidence regulators who obtained the position of insurance commissioner by popular election and those who seek higher elective office following their tenure as insurance commissioner allow higher overall “unit prices” relative to competitive market states. The “unit price” of insurance in regulated states is not statistically different from the competitive market outcome for regulators that make lateral moves back into state government and it is mildly higher for regulators who enter the insurance industry following their tenure. Finally, we find some evidence regulators who describe themselves as consumer advocates are successful reducing the price of insurance in favor of consumers in regulated markets. Overall the results are consistent with the existence of asymmetric information in the regulatory process that agents use to enhance their career aspirations.

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1. Introduction

Does insurance price regulation systematically influence prices in insurance markets? This question has received a good deal of attention in the insurance literature. In a recent paper, Harrington (2002) analyzed data from the 1970s to the 1990s and concluded that, on average, insurance price regulation has had little overall effect on rate levels and claims costs over time. Interestingly, however, he noted that in some time periods rate regulation has had a significant impact on insurance prices – at times holding

prices above competitive levels and at other times suppressing rates. In a similar vein, Cummins et al. (2001) also suggest price regulation has a disparate effect depending on the state. Unfortunately there is very little research to suggest why price regulation appears to have differential effects in some states and/or for only certain periods of time even though over the long run the mean effect appears close to zero.

One possibility for the time-varying state specific impact of rate regulation may be due to the objectives of the insurance commissioners themselves. The political economy literature asserts the educational and professional background of regulators as well as their post-government employment prospects provide incentives for policymakers to either favor

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or oppose the industry they oversee – the so-called revolving door hypothesis (e.g., Eckert, 1981; Spiller, 1990). In this research, we test whether anticipation of future employment prospects provide incentives for insurance regulators to be either more or less aggressive in their regulatory decisions depending upon the likelihood of employment by the industry following their tenure as commissioner.

We investigate the environment for insurance regulation from a number of perspectives. First we examine the biographical background of the regulator as well as the regulator's post-agency employment. This is an attempt to control for incentives to use the revolving door between industry and regulators. Second, we look at the type of regulatory environment in terms of regulator selection and type of regulatory authority each commissioner can legally exercise over automobile prices. Finally, we include a number of market structure variables prior research has shown to be important determinants for the price of automobile insurance.

While researchers have examined one or two of these issues previously, we add to the literature in several ways. First, most of the previous empirical literature which has considered the regulators' career incentives focuses on incentives facing regulators in multi-commissioner administrative agencies (e.g., Cohen, 1986). We can look at the insurance regulator, which is traditionally, a single commissioner agency. Thus, we are able to link the outcome in the marketplace to the decisions of a single regulator to directly test the revolving door hypothesis. Second, we specifically focus on automobile price regulation which differs among the states. Some states, for example, grant the insurance regulator so-called prior approval authority where the regulator must approve the rates prior to their use. Other states do not grant their regulator this power. Thus, we are able to look at regulatory incentive differences between states with various degrees of price setting authority with our benchmark case being states that allow market forces to prevail.

Our paper is organized as follows. First, we present a short background on the literature we employ to motivate the paper. Second, we describe the data and the hypothesis we use. Third, we present the methodology followed by a discussion of the results. We end the paper with a few concluding comments in Section 6.

2. Background

An important hypothesis in the economics of regulation suggests the possibility of capture of the regulator by the industry (Stigler, 1971). However, as Peltzman (1976) suggests, capture may not be by the regulated industry, but by some other pressure group that succeeds in using the power of the regulatory process to benefit its members. Since this time, a large theoretical literature has evolved to examine the incentives of regulators given the potential long term interaction the regulator can have with the industry. For example, Laffont (1994) summarizes the principal-agent lit-

erature and its application to regulatory behavior. Laffont and Martimort (1999) describe a particular constraint on collusion which allows for more efficient contracting between the government and the regulator by mandating separation of regulatory powers among various regulators. Thus, the literature has evolved to describe the possibility of collusion between the regulator and the industry as well as some potential solutions.

Martimort (1999) specifically discusses the dynamics of the interactions with the regulator and an interest group over time. An obvious result of these dynamics is possible collusion between the industry and the regulator. One vehicle to dynamically influence current regulatory decisions is the possibility of post-agency employment in the regulated industry – the so-called revolving door problem. The potential revolving door generates much debate with some commentators suggesting the potential for capture is so severe that restrictions should be imposed to forbid post-government employment by the regulated industry. President Clinton, for example, promulgated an executive order which prohibited certain executive appointees from lobbying their respective agencies for five years after their service ended.¹ Congress and some of the states have also passed laws restricting others from lobbying their former agencies.²

Others suggest these restrictions lead to decreases in economic efficiency as they disallow individuals with a better understanding of the regulatory process to more efficiently guide the entity to comply with the regulations. For example, Che (1995) suggests the need for specialized knowledge transfer is potentially optimal for both the agency and the industry and the incentive to invest in acquiring this knowledge will be reduced when post-agency employment restrictions are introduced. To study this problem, Che developed a theoretical model with three actors: the government, the regulator, and the industry. The government appoints a regulator whose job is to observe the cost characteristics of the industry. In this environment, the presence of the revolving door provides a number of incentives. For example,

¹ Executive Order 12834 (January 20, 1993) repealed by President Clinton in Executive Order 13184 (December 28, 2000) effective noon on January 20, 2001 at http://www.usoge.gov/pages/laws_regs_fedreg_stats/lrfs_files/exeorders/eo13184.pdf.

² The Congressional legislation contains a permanent two year restriction of representational activities for items within the official's responsibility while in office. In addition, the law prohibits representation of anyone who has an interest in an action that the official participated in while in office; prohibits switching sides (for example the attorney general could never represent someone on the other side of a case he oversaw while he was in office), and prohibits senior political appointees from contacting their previous agency for a period of one year after separation. See e.g., 18 USC § 207. Some states also have various degrees of prohibitions regarding post-agency employment. California, for example, prohibits certain classified employees (legislators and regulators are two examples) from representing a client before their former employer for one year following separation and provide for a permanent ban on switching sides. See e.g. <http://www.fppc.ca.gov/index.html?id=33>. Gely and Zardkoohi (2001) provide a history of these restrictions.

ex ante the revolving door provides incentives for regulators to do their job better and build human capital in the technicalities of the industry. *Ex post*, after expertise has been acquired, it may further provide a disincentive to pursue the government's objectives. This second argument generally generates the call for closing the revolving door while the first argument suggests social benefits from the revolving door.

The equilibrium from Che's model suggests three possible outcomes. In the first case, the firm observes the regulator's qualifications and depending on the nature of the qualifications, an effort to improve the regulator's qualifications may either enhance or interfere with the ability to monitor the firm. If the regulator seeks to sell regulatory or technical expertise in the future, then permitting a revolving door will provide an incentive to monitor the firm better. However, if the regulator is subsequently hired for her ability to influence her former agency, then permitting a revolving door will divert effort away from monitoring.

The second case is based on signaling when the firm cannot observe the regulator's qualifications. In this case, if the regulator is interested in a subsequent industry position, then she has an incentive to be an aggressive monitor so as to signal technical competence for the future position. The government benefits from this aggressive monitoring and, thus, permitting a revolving door is optimal for the government.

In the third case, Che introduces the possibility of collusion between the regulator and the firm. Normally collusion is thought to be detrimental to the interests of the government, but Che asks whether there are situations when the government would permit collusion. For example, if the government permits collusion between the regulator and the industry, the regulator has an incentive to be lenient towards the firm in the hopes of a future employment contract. However, this contract cannot be legally specified or enforced as it is, essentially, bribery. Because of the lack of contractibility, it is not clear whether the firm would prefer a regulator who was lenient or one who was technically competent. The government could allow this potential collusion (and resulting lack of enforceability) and permit a revolving door if it thought there were benefits from potential increased monitoring.

Another approach to the revolving door problem is from Salant (1995). He argues the possibility of post-government employment by the industry may lead to better investment incentives for the regulated industry. One of the main concerns in public utility regulation has been the fear that certain investments would be disallowed in the rate base at some later date. If firms are afraid that investments will be *ex post* disallowed, they will not make the potentially needed investments. A revolving door, however, would permit regulators to capture some of the future benefit of the investment as they would be more likely to allow the regulated entity to recover sunk cost investments if they can participate in the future efficiency gains.

A number of interesting empirical analyses of pre- and post-agency employment effects exist in the literature. In

the political science literature, researchers have looked at prior employment, regulatory voting patterns, and subsequent employment, but these early studies suffer from failure to control for the endogeneity of a regulator's choice following separation from office (Gormley, 1979 and Cohen, 1986). More recently, researchers are attempting to see if there exists evidence of the revolving door using other approaches. Gely and Zardkoohi (2001), for example, test whether there is an effect on client firms if one of the major Washington lobby/law firms has a senior partner appointed as a cabinet level secretary in the US government. Using data from every cabinet level appointment from President Carter's to President Clinton's first term inclusive, they use an event study methodology and find that for Presidents Carter, Reagan, and George H.W. Bush, cabinet secretaries' former client firms' stock prices display a significant excess return on the announcement of an appointment of a lobbyist to a cabinet position. Thus, clients benefited from having appointments due to the gain in idiosyncratic knowledge and connections the lobbyist makes while in office which may benefit the clients in the future. As mentioned above, President Clinton prohibited his nominees from returning to lobbying for five years after their separation from office and for his appointments, there was a negative announcement effect attributable to either a loss of current effectiveness as a lobbyist or the fact that a five year disqualification reduced the cabinet secretary's future effectiveness as a lobbyist.

A more recent empirical paper looks at the performance of US Attorneys and their subsequent employment. Boylan (2005) takes an approach similar to ours in the sense that he examines biographical detail of the prosecuting attorneys and examines their subsequent employment. Boylan has an objective function for the prosecutor that maximizes prison time (measured in months) rather than conviction rates. He finds that prosecutors with higher "prison months" are rewarded with superior jobs with law firms or are appointed federal judges.

As mentioned above, we are interested in looking at the pre- and post-career incentives across states with different degrees of regulatory power. We focus specifically on the auto insurance market which has been studied intensively in the recent past (Grabowski et al., 1989; Harrington, 2000; Cummins et al., 2001 among others). Harrington (2002) is the most recent study to attempt to discern the effects of price regulation in the automobile insurance market. He compares the so-called prior approval states where insurers are required to submit their proposed rates to the insurance commissioner prior to being approved to the competitive market states which allow insurers to begin using new rates in the marketplace.³

³ See Appendix A for the current and historical classification system in place. We follow Harrington (2002) and classify any state law that has a prior approval element (categories 1, 2, and 3 in the Appendix A) as a prior approval law.

Harrington empirically examines (by year) the effect of prior approval regulation on private passenger auto rates. *A priori*, one might expect states with prior approval statutes would have lower “prices” all other things being equal as the regulator has the opportunity to examine the rates prior to their approval and has the power to compel the provision of evidence regarding costs and assumptions to support the rate request. Consistent with much of the previous literature, Harrington finds no systematic effect of prior approval on loss ratios over time. Some years the effect is positive, some years it is negative, and in most years it is not statistically significant. This result seems to persist and can be seen easily by looking at Fig. 1 which displays the time series of unit price ratio across the all lines of personal automobile insurance coverages over the years of our study. Regulated prices are lower than unregulated prices in some years and in other years the reverse is true.

In addition to pre- and post-employment incentives, we also examine whether the selection mechanism, elected versus appointed, influences the effect of regulation on the market. Some 22% of our sample (based on state-year observations) of regulators is elected in a statewide election. Currently, 13 states elect their insurance commissioner through such elections and the remaining states employ some executive or legislative appointment process to select their regulator.

Our analysis regarding the impact the selection mechanism might have on price outcomes is guided by several papers which theoretically and empirically explore outcome differences in regulated markets when regulators obtain their positions via direct election versus political appointment. In recent theoretical work, Besley and Coate

(2003) note while it seems self-evident elected commissioners will be more closely aligned with voters’ interests, they also note appointed commissioners are, in turn, appointed by elected officials. So, is there truly a difference between an appointed or elected official if everyone is subject to democratic control? When regulators are appointed, Besley and Coate theorize regulatory policy becomes bundled (and confused) with other issues the appointing politicians oversee. However, as voters have only one vote and regulatory issues are not always salient for most voters, there are incentives for the appointed regulator to respond to interest group rather than voter interests. In contrast, it seems obvious that if regulators are elected, their stance on regulation is the only important issue so that the electoral incentive is to run a pro-voter or pro-consumer candidate.

A majority of the empirical literature that has investigated differences in regulatory outcomes as a function of the selection mechanism of the regulator is consistent with Besley and Coate’s hypothesis that elected commissioners will be more pro-consumer. Besley and Coate themselves examine a panel of energy prices at the state level and find evidence of elected commissioners being associated with lower prices. Smart (1994) finds that telephone rates from the 1980s were significantly lower in states that elected their public utility commissioners. Finally, Formby et al., 1995 find the bond ratings of electric utilities are significantly lower for firms headquartered in states with elected public utility commissioners consistent with regulators reducing profit margins in the favor of consumers. Interestingly, our result regarding differences the selection mechanism has on the regulated price of insurance differ from Besley and Coate hypothesis. We attribute our result to

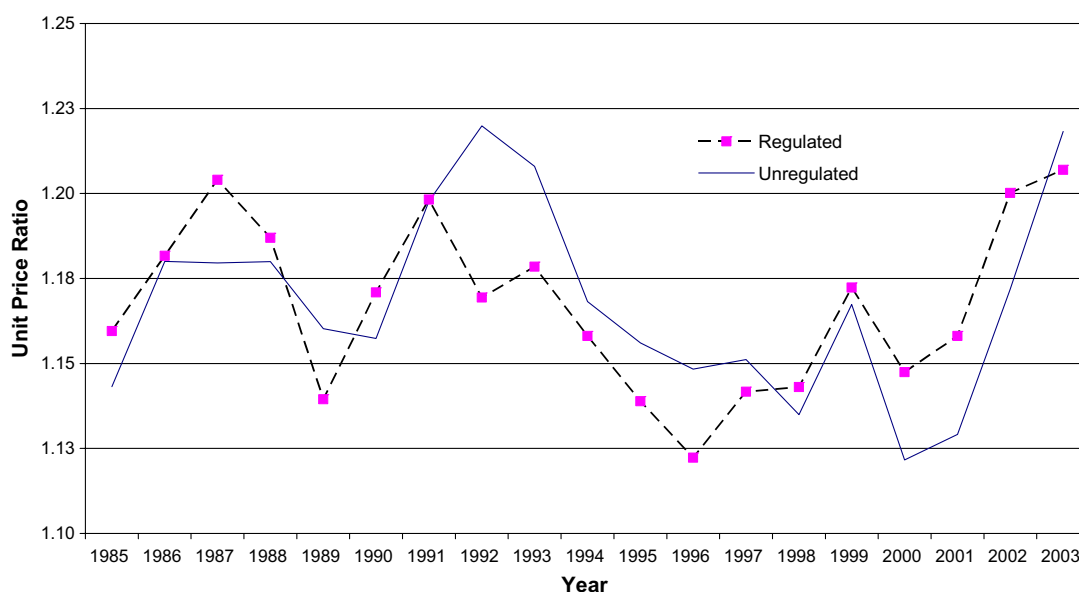


Fig. 1. Personal Automobile Unit Price Ratio All Coverages by Regulatory Regime: 1985–2003. Figure displays the unit price ratio for regulated versus unregulated states over the time period 1985–2003. The unit price ratio is defined as direct premiums earned divided by direct loss and loss adjustment expenses incurred plus policyholder dividends paid. Appendix A provides a listing of the regulated and unregulated states. We include both liability and property damage premiums and losses. Source: National Association of Insurance Commissioners.

an important difference in the institution structure of public utility commissions versus state insurance departments. We discuss this further below.

We have two strands of the literature we use in conjunction with the traditional regulated/non-regulated market distinction that may help us determine the effect of regulation state on auto insurance markets. By controlling for pre- and post-agency employment, we may be able to control for revolving doors. In addition, by controlling for the election of the regulator we may also be able to improve our understanding of how the incentives influence automobile insurance regulation. We discuss this more thoroughly in the next section.

3. Data and hypothesis development

We investigated a number of variables hypothesized to explain differences in the price of automobile insurance across state markets. We obtained biographical data on insurance regulators, a set of economic and state specific market structure variables, state specific regulatory variables, and a state specific regulatory selection variable. In this section we describe our data sources and the hypothesis that we will test.

The primary source of the regulator biographical detail came from the [National Conference of Insurance Legislators Insurance Legislative Fact Book and Almanac](#). This is an annual publication we were able to obtain from 1985–2004. We supplemented missing information from searches in *Lexis-Nexis*, *Factiva* (a Reuters/Dow Jones news service), and the internet. As a result we obtained information on all 254 insurance commissioners in office from 1985 to 2002. In our analysis we eliminate 10 regulators who were in office for only a short period of time as acting commissioners. And further, we were not able to identify the post-employment activities for 23 others. Thus, we have complete information on 221 regulators.

We classify the prior career choices of the insurance commissioners into the following categories. We define a *career insurance bureaucrat* as one who spent a majority of his or her career in the department of insurance; *career bureaucrats* (non-insurance) are officials who had significant state civil service careers outside of the insurance commission; a *career politician* category represents those who had elected political positions prior to becoming insurance commissioner; the category *private insurance sector employee* is for those who worked predominantly in the insurance industry; *private sector other* is for those who had jobs in industries other than insurance⁴; and, finally, the category *mixture* contains those who had careers in both industry and government prior to being insurance commissioner.

In addition to their prior employment history, we searched local newspapers, industry trade press, and the internet to identify the subsequent employment of insurance commissioners when they left office. The first category, *return to insurance department*, is for those who return to the agency (usually as a senior deputy commissioner). A number (almost 3%) of the commissioners were deputies who took acting positions which lasted more than six months and then later returned to the insurance commission. A second category of post-agency employment is for those who *sought* (successfully or unsuccessfully) *higher office*. A third category is for those who were subsequently employed in the *private sector in the insurance industry* while those that go to some other industry are classified as *private sector – other industry*.⁵ We also created a category for those who were *indicted, jailed, or resigned due to ethical charges*. Finally, we have miscellaneous categories for those *died, retired*, or who were *currently serving* as insurance commissioner during the final year of our study (2002).

In addition to pre and post-agency employment, we also have data on the selection method (elected v. appointed), the type of price regulation used in the state (e.g., prior approval), length of tenure in office, whether the regulator is a self-described consumer advocate, a lawyer, college graduate (both undergraduate and graduate school), and the gender of the regulator.

We use the NAIC's annual statement dataset for years 1985–2002 to obtain information about the state automobile insurance markets. The state page provides detail on total premiums collected, losses and loss adjustment expenses incurred, and policyholder dividend paid. We use these variables to create the dependent variable for our analysis – the unit price of insurance (otherwise known as the premium ratio). Unit prices for a given state are calculated as the total state premiums earned divided by the sum of total state direct losses and loss adjustment expenses plus policyholder dividend paid of private passenger auto insurance.

In addition to the premium and loss information used to construct the dependent variable, we also obtained information about the percent of losses incurred in no-fault private passenger and the percent of losses incurred in auto liability lines relative to all automobile lines of insurance (liability plus property). We used [AIPSO Facts \(various years\)](#) to gather information regarding the size of the states' residual markets in terms of premiums written, the number of cars years insured and the number of car years in the residual market. From these data we were able to calculate the average loss per car-year and the average premium per car-year as well as the percent of drivers who were unable to obtain insurance in the voluntary insurance market but instead were insured in the residual market.

⁴ For our empirical analysis we merged some of our categories to conserve degrees of freedom. Thus, we treat career insurance bureaucrat and non-insurance career bureaucrats as a single category we call career bureaucrats for our subsequent empirical analysis.

⁵ Again, we collapse the private sector post-employment categories into one called post private sector.

We obtained an index reflecting on the political ideology of the state commonly employed in the political science literature from Berry et al. (1998). This index identifies the ideological position of each state's Senator and Member of Congress using ratings from various interest groups such as the ACLU and the ADA. Berry et al. then estimate the citizen ideology for each Congressional and Senate district using the incumbent's score, the estimated score for a challenger, and election results that are assumed to reflect the ideological divisions in the electorate. These scores are then used to create an unweighted average for the state as a whole.⁶ We use this ideology variable as a control for the political environment of the state. Similarly, we use as controls data from the Bureau of the Census on poverty rates, miles driven in urban areas, population density, and real per capita income. Finally, we obtained the percent of the direct writers premium by state from the Best's Executive Data Service and the A.M. Best Key Rating Guide. Previous research (Berger et al., 1997) suggests that insurers that employ exclusive distribution agency systems are lower cost providers and therefore their relative market share will influence statewide pricing.

The unique aspect of this study is that we control for possible career motivations by the regulator and we specifically test for the revolving door by examining the marginal effects of the *ex ante* and *ex post* employment choices of the regulators. We have two major hypothesis regarding how regulators price insurance within the state. Our first major hypothesis is that prior approval regulation should influence prices negatively. While previous studies (e.g. Harrington (2002)) have not found a persistent econometric relationship between regulatory stringency and prices, we propose this as the testable null hypothesis. In addition, following Besley and Coate (2003), we assert the elective selection mechanism should have the testable hypothesis of reducing prices within a state as the insurance commissioner election should be focused on relatively salient issues for the insurance consumer/voter.

Our hypotheses about the effect of pre and post-agency employment are not necessarily determinable without guidance from theory. However, if we assume the revolving door imposes net costs on society, we can develop a set of hypothesis consistent with this conjecture. In terms of pre-commissioner employment, one would expect that commissioners coming from the private sector would have higher prices if one believes that an open and revolving door would induce the industry to capture the commission. For those who currently work in the commission and are appointed commissioner, the presence of the revolving door would induce them to be favorable to the industry in their pricing decisions. However, as Che discusses, the industry can employ a former regulator for two reasons:

technical competence or the ability to influence the regulatory agency in the future.

A career politician arguably has no interest in seeking employment with the insurance industry since presumably he desires higher office. In this case the insurance commissioner will use his pricing power to maximize his expected post-regulatory chances with the voters. However, because a subsequent election will have bundled electoral issues it is not clear how important or salient the service on the insurance commission will be to the voters. If this is the case, a lenient regulator may be able to extract future political support from the industry. Thus, the expected sign on the coefficient for political agents is not determinable.

Someone with a mixed background (with careers in both government and the private sector) has an ambiguous effect on regulatory pricing in the state. To the extent that a person has some technical experience in any industry, he or she is likely to be appointed as insurance commissioner for skills or connections unrelated to insurance. The regulator could be selected either because of a connection to the governor or management ability, or both. To the extent these are valuable qualities to the insurance industry, or to any other industry, there may be a revolving door. However, it is not clear if these attributes benefit the insurance industry specifically and thus, the sign of the expected relationship is also indeterminate.

If Che is correct that regulators either who have technical skills or who are able to learn on the job are more valuable to the industry, then we should see that all regulators have some positive likelihood of being employed in the industry after they leave their position as a regulator. This is supported by the data as over half of the commissioners in our sample who left office by 2002 took positions in the insurance industry. This percentage of industry employment is consistent with other regulated industries (see e.g. Eckert, 1981; Spiller, 1990). However, people seeking higher office are likely to have slightly different interests and, again, how this future career path influences current regulatory behavior probably depends upon how salient insurance issues are for the next campaign. Thus, it is not clear how those that are seeking future office would regulate prices. In contrast, those who return to the commission or to other state positions after serving as commissioner show a preference for public service rather than for working with the industry. Those that return to the commission are likely to be free from temptation to ingratiate themselves with the industry.⁷ Thus, they are hypothesized to have no effect on insurance prices. Finally, we aggregate the other categories together of those who died, were missing, or were indicted.

We also have an indicator for whether the person is a self-declared consumer advocate. We classify someone as an advocate when something in the person's background,

⁶ This index can be obtained at <http://webapp.icpsr.umich.edu/cocoon/ICPSR-STUDY/01208.xml>.

⁷ Alternatively, using Che's signaling notion, these regulators may have revealed their type and have no value to their industry, so the next best position they can obtain is a demotion.

Table 1
Summary statistics: background and careers of state insurance regulators over the years 1985–2002

Variable	Regulated (%)	Competitive (%)	T-test $\mu_{\text{reg}} = \mu_{\text{comp}}$
<i>Characteristics and background</i>			
Indicator = 1 if commissioner is elected	22.52	6.36	3.51***
Tenure in office (years)	4.64	3.95	1.46*
Consumer advocate	3.60	0.91	1.36*
College graduate	90.99	90.91	0.02
Graduate from law school	49.55	38.18	1.71**
Degree from graduate school	20.72	28.18	1.29*
Male	74.77	78.18	0.60
<i>Career prior to tenure as insurance commissioner</i>			
Career insurance bureaucrat	18.92	18.18	0.14
Career bureaucrat not just insurance	15.32	24.55	1.73**
Career politician	13.51	7.27	1.53*
Private sector insurance industry	17.12	16.36	0.15
Private sector not exclusively insurance	12.61	6.36	1.60*
Mixture gov't and private sector	22.52	27.27	0.82
<i>Employment after tenure as insurance commissioner</i>			
Returned to insurance department	2.70	5.45	1.04
Seek higher office	8.11	6.36	0.50
Private sector insurance	45.05	50.00	0.74
Private sector other than insurance	9.91	15.45	1.24
Indicted, jailed or resign amid ethical charges	3.60	1.82	0.82
Died	0.90	0.00	1.00
Retired	5.41	6.36	0.30
Still in office in 2002	11.71	1.82	2.99***

Table compares the prior and post-employment choices of insurance commissioners by the regulatory regime of the state. We identify commissioners as coming from either regulated or unregulated states based upon the law in place during the last year of the commissioner's tenure. We include all insurance commissioners that were in office over the time period 1985–2002. The total number of insurance commissioners over this period was 254 of which 10 were eliminated because they were appointed as short term acting commissioners and 23 we were unable to identify their employment choice after leaving office. There are 110 regulator observations from competitive states and 111 regulator observations from regulated states. ***, **, * denotes statistical significance at the 1%, 5% and 10% levels, respectively.

such as previous employment or personal statements in the press, caused us to conclude the person viewed themselves as consumer advocates. This is a conservative measure as we did not infer this status without specific evidence.⁸ We expect that consumer advocates would have the effect of lowering prices in the state.

⁸ In fact, we only have 4 in our dataset. Two of them, Robert Hunter and Jay Angoff are nationally-known consumer advocates in insurance and were also known to be so prior to their service as insurance commissioners. For the others we have affirmative quotes from interviews in which they describe themselves as consumer advocates.

Table 1 shows descriptive statistics concerning the regulators in the sample separated by the type of regulation. We find there are more elected commissioners in the regulated sample. The results also suggest regulated states' commissioners tend to serve longer (by about six months), are more likely to have a self-proclaimed consumer advocate, and are more likely to have lawyers serving as regulators. Regulated states are less likely to have career bureaucrats (from either the insurance commission or other state agencies) but are more likely to have politicians serving as a regulator. Regulated states are more likely to have commissioners who come from some private industry other than insurance. Finally, the last panel of the table shows that where regulators end up after their tenure does not seem to differ (in an univariate sense) on whether the state is regulated or not.

Table 2 shows a transition matrix from the prior-position (the job or career held prior to becoming a regulator) to the post-agency position which represents the job or career path of the regulator after separation from the insurance commission. As mentioned previously, a large plurality (105 of the 206 commissioners who left office by 2002) go to the insurance industry after serving as the insurance commissioner which is suggestive of a revolving door. Another 14% go to the non-insurance private sector, and a further 14% take lateral moves into state government. The remaining sought higher office (8%) retired (6%), returned to a position in the insurance department (4%), or left office under a legal or ethical cloud (3%). Only one commissioner died before taking a new position.^{9,10}

It is interesting to note in Table 2 that a only a slight majority (57%) of the regulators that chose to enter the insurance industry had experience in the private sector prior to the tenure as commissioner. The remaining commissioners who went to the insurance industry had only public sector prior work experience. Thus, not only is employment by the insurance industry the most popular post-employment choice for regulators, it also appears to be an equally attractive choice regardless of the commissioner's prior work experience. This is not the case for all post-employment choices. For example, of the nine cases where the commissioner remained in the state insurance department after leaving their position as commissioner, almost all of them (78%) worked exclusively in the insurance department prior to their time as insurance commissioner.

⁹ We have evidence that some have died subsequent to a post-agency career. For example, the former insurance commissioner of New York became the director of the New York/New Jersey Port Authority and was killed in the WTC attack on 9/11. He is not classified as deceased, but as taking a "lateral" position in government.

¹⁰ In results not reported here, we also created transitional tables for regulators in prior approval states versus competitive market states. The tables are almost identical and there are no discernable differences in either the *ex ante* labor market choices of regulators or their *ex post* career decisions following their tenure relative to the results shown in Table 2. These tables are available from the authors upon request.

Table 2
Employment choice following tenure as insurance commissioner

Career prior to being insurance commissioner	Num	Insurance department	Lateral move in state gov't	Seek higher office	Private sector insurance	Private sector other than insurance	Indicted or resigned amid ethical charges	Died	Retired	Still in office in 2002
Career insurance bureaucrat	41	7	5	0	15	3	1	0	4	6
Career bureaucrat not just insurance	44	1	9	1	23	7	1	0	0	2
Career politician	23	0	3	8	7	1	0	0	2	2
Private sector insurance industry	37	0	0	0	23	5	1	0	5	3
Private sector not exclusively insurance	21	0	3	1	9	5	2	0	1	0
Mixture gov't and private sector	55	1	8	6	28	7	1	1	1	2
Totals	221	9	28	16	105	28	6	1	13	15

Table describes the first employment choices of insurance commissioners immediately after leaving office. We include all insurance commissioners that were in office over the time period 1985–2002. The total number of insurance commissioners over this period was 254 of which 10 were eliminated because they were appointed as short term acting commissioners and 23 we were unable to identify their employment choice after leaving office.

4. Estimation methodology

As discussed above, we seek to determine if the professional background or if the post-agency employment prospects of the insurance commissioner provide incentives for the regulator to either favor or oppose the insurance industry. Our empirical strategy is to analyze the effects of regulation on the price of personal automobile insurance by estimating regressions where the dependent variable is the unit price of insurance and the independent variables, in addition to controlling for various economic and market structure effects, include the background of the regulator in office (prior job experience), the regulator's selection mechanism (appointed/elected), and the regulator's foreground (where the regulator is employed following their tenure). We are able to isolate the private incentives of the commissioners in regulated regimes since approximately half of the states during our sample period operate largely free of regulatory interference (competitive market states) while the insurance regulator has a mandate to oversee and approve the price of insurance in the remaining states (regulated states). Thus, we are able to specifically analyze the effect of pre and post-agency employment in regulated states as the competitive states serve as the benchmark.

The basic specification of the model we estimate is as follows:

$$p_{it} = \beta^m X_{it}^m + \gamma PA_{it} + \beta^r PA_{it} X_{it}^r + \eta_i + v_t + \varepsilon_{it}, \quad (1)$$

where p_{it} is the unit price of automobile insurance in state i in year t , X_{it}^m is the vector of explanatory variables controlling for economic and market structure effects in state i in year t hypothesized to influence unit prices independent of the regulatory environment in the state, X_{it}^r is vector of indicator variables controlling for the professional background, the prior and post-employment choices of the

insurance regulators and the manner by which the regulator attained the position in state i in year t , PA_{it} is the indicator variable equal to one if state i has a prior approval law in year t and zero otherwise, γ is the estimated effect of prior approval rate regulation, β^m is the vector of estimated coefficients for the market structure and economic environment in state i for year t , β^r is the vector of estimated coefficients for the regulator profile variables in regulated state i for year t , η_i is the state specific error term for state i , v_t is the year specific error term for year t and ε_{it} is the random error term for state i in year t .

There are two econometric problems we consider in order to estimate Eq. (1) correctly. First, the theoretical possibility exists the decision for a state to adopt rate regulation is jointly determined with the unit price of insurance.¹¹ Under this circumstance, the dummy variable PA_{it} cannot be treated as exogenous and failure to control for the endogeneity could lead to biased coefficient estimates for γ and β^r . Likewise, it is reasonable to presume the regulator's post-employment choice is also jointly determined with the decisions the regulator makes while commissioner. For example, a regulator's future employment prospects with the industry may rise if he chooses to either regulate insurance prices less aggressively or possibly allow prices to exceed what would otherwise be the competitive market outcome in the state. An avowed consumer advocate may garner increased stature with certain interest groups if she uses her position to more aggressively regulate insurance prices.

¹¹ The two papers that have explicitly tested for the endogeneity of rating regime in automobile insurance provide mixed results. Using a panel data approach, Cummins et al. (2001) report evidence consistent with the hypothesis that states self-select into a particular regulatory regime. Harrington (2002), on the other hand, uses a time-varying coefficients approach and is unable to reject the null hypothesis of exogeneity.

To control for these two possible sources of endogeneity, we estimate a selection adjusted version of Eq. (1) using a variant of Heckman's (1978) two-step estimation method. Specifically, we consider the following two selection equations:¹²

$$PA_{it}^* = \theta' A_{it} + u_{it}, \quad (2)$$

$$p_{ixy}^* = \log\left(\frac{\pi_{ixy}}{\pi_{ix0}}\right) = \sum_y \alpha'_y B_{ix} + \omega_{ixy}, \quad (3)$$

where PA_i^* is the unobserved sentiment for rate regulation in state i in year t , p_{ixy}^* is the unobserved log-odds that regulator x in state i chooses employment choice y following her tenure as insurance commissioner, A_{it} is the vector of exogenous variables hypothesized to be related to the likelihood state i is a regulated state, B_{ix} is the vector of exogenous variables hypothesized to be related to the employment choices of regulator x in state i following his tenure as insurance commissioner, θ , α_y is the estimated coefficient vector for each employment choice y , u_{it} is the error term from the regulation selection equation and ω_{ixy} is the error term from the post-employment choice selection equation.

Using the results of Heckman (1978) and of Lee (1983), and as long as we make the assumption that the error terms from the selection equations are independent of one another, i.e., the $Cov(u_{it}, \omega_{ixy}) = 0$, than it can be shown that the selectivity bias in Eq. (1) can be corrected by including inverse mills ratios calculated using the results of estimating the two selection equations. To see this, first define

$$\lambda_{it}^r = \frac{\phi(\theta' A_{it})}{\Phi(\theta' A_{it})} \quad \text{and} \quad \lambda_{it}^c = \frac{-\phi(\theta' A_{it})}{1 - \Phi(\theta' A_{it})}, \quad (4)$$

where λ_{it}^r and λ_{it}^c are inverse mills ratio for regulated and unregulated states, respectively, $\phi(\cdot)$ and $\sigma(\cdot)$ are probability and cumulative normal distribution functions, respectively, and θ is the vector of estimated coefficients from a probit regression where the prior approval rate regulation dummy is the dependent variable.

Similarly, we need inverse mills terms for each post-employment choice. To calculate the mills ratios for post-employment choice, first define P_{ixy} to be the probability that regulator x from state i chooses the y th post-employment choice. As shown in McFadden (1974), $P_{ixy} = \exp(\alpha'_y B_{ix}) / \sum_{a=1}^5 \exp(\alpha'_a B_{ix})$ where α_a is the vector of coefficients for post-employment choice a obtained from a multinomial logit regression of Eq. (3) estimated using maximum likelihood estimation.¹³ In our empirical work we consider five possible post-employment choices for regulators: (1) officials who make a lateral move back into public service; (2) officials who seek and possibly obtain

higher political office; (3) officials who enter private industry in insurance; (4) officials that enter private industry in some industry other than insurance; and (5) commissioners who retire after leaving office. Consistent with the previous literature, we exclude from our analysis regulators who were either still in office at the end of our sample period (2002) or those who died or were indicted while in office. We eliminate these observations as these regulators did not make voluntary post-tenure career choices (i.e. death or indictment). The reference group for this study is regulators that retire after leaving office.

Once we have the estimated probabilities we then construct inverse mills ratios for each post-employment choice y using the method suggested by Lee (1983) as follows:

$$\lambda_{ixy} = \frac{\phi[\Phi^{-1}(P_{ixy})]}{P_{ixy}} \quad \text{for } y = 1, 2, 3, 4, 5. \quad (5)$$

We can now make the necessary adjustments needed to estimate Eq. (1) consistently. In particular, when the error terms of the two selection equations are independent, Maddala (1983, p. 279–282), demonstrates the expected value of the error term from the unit price regression, ε_{it} conditional upon any particular regulatory regime $s = r$ or c (i.e., the prior approval indicator $PA_i = 1$ or 0) and any post-employment choice by a regulator, call it choice $y = a$, will equal¹⁴

$$E(e_i | s, y = a) = -Cov(e_i, u_i | s) \lambda_i^s - Cov(e_i, \omega_{ixy} | a) \lambda_{ixa}, \quad (6)$$

where $s = r$ refers to a regulated state and $s = c$ to an unregulated state, respectively. Thus, we get consistent estimates of the parameters in price regression by first estimating Eq. (2) by probit and Eq. (3) by multinomial logit and then using the seven inverse mills terms as additional regressors in Eq. (1).

The exogenous variables in the probit regression includes the market structure variables discussed earlier plus five additional instrumental variables to control for various political factors we hypothesize are related to the likelihood the state adopts rate regulation. We control for the how liberal or conservative the average elected official is in the state using the state government ideology index developed by Berry et al. (1998). The index ranges from 0 to 100 with higher scores associated with public officials favoring more liberal (i.e., interventionist) policies. Thus, we expect a positive relationship between the likelihood a state adopts rate regulation and how liberal the state is measured to be using the ideology index. We also include measures of how urbanized the state is by including the population density (population per square mile) and the percentage of vehicle highway miles traveled in urban areas. We hypothesize more urbanized states are more likely to adopt rate regulation consistent with the hypothesis of urban drivers seeking subsidies from rural drivers enforced through a prior approval regulatory system

¹² Time subscripts have been suppressed to simplify the exposition.

¹³ Note, in order to get unique estimates for α_y , the probabilities are calculated relative to a reference group which allows the corresponding coefficient vector to be set equal to zero.

¹⁴ We suppress the subscript t in Eq. (6) to facilitate the discussion.

(Smith and Wright, 1992; Tennsyon et al., 2002). We hypothesize the percentage of a state's private sector labor force employed by the insurance industry will be negatively related to the likelihood the state adopts rate regulation consistent with the hypothesis the insurance industry, all else equal, prefers to operate in markets free from regulatory interference in pricing. Finally, we include two variables to control for demand differences for rate regulation related to income: real state per capita income and the percent of the population below the poverty line.

We estimate the post-employment choice of the regulators multinomial logit using observations of the regulator during their final year in office. The exogenous variables include the vector of prior professional experience indicator variables as well as several additional instruments. We include two indicator variables to control for the educational background of the commissioner: the first equals one if the commissioner has a law degree and the second equals one if the commissioner has a Master's or Ph.D. degree. Finally, we include a dummy variable set equal to one if the commissioner is a male.

We include two variables designed to control for the relative size of the insurance market in the state. The first instrument equals the percent of gross state product coming from the insurance industry. We include this variable as we hypothesize it will be more difficult for insurance regulators to make non-benevolent choices during their time in office given the importance of the industry for the local state economy. The second size variable equals the percent of the state's insurance gross state product relative to the sum of the insurance component of gross state product across all states. We include this variable to control for the extent of the interactions the commissioner is likely to have with industry representative during their time in office.

To control for the salience of the cost of automobile insurance among the voters of the state, we include the average losses per vehicle in the state relative to the average losses per vehicle nationwide. Finally, we include a variable designed to measure how well the automobile insurance market in the state performed during the commissioner's final two years in office relative to the nationwide market equal to the percentage of drivers in the state that received insurance in the involuntary market minus that same percentage calculated at the national level. We lag this variable one year to avoid simultaneity bias. We do not have a strong prior regarding the expected sign on the relative size of the involuntary market variable.

In summary, we estimate Eqs. (1) and (2) using data on all 50 states for all years 1985–2002 (we exclude the District of Columbia). We eliminate observations where we were unable to locate the prior or post-employment choices of the regulators in office and those where the regulator did not make a post-employment choice either because she is still in office or because she died or was indicted while in office. Our final data set includes 708 state/year observations (out of a possible $19 \times 50 = 950$ observations). In our most fully specified model, we estimate Eq. (1) via

weighted least squares including two inverse mills terms to control for the potential endogeneity of the regulatory regime and five inverse mills term to control for the potential endogeneity of the regulator's post-employment choice. We also include dummy variables to control for both unobserved state and year fixed effects. We weight the regression by the square root of the number of written car years in the state to control for heteroskedasticity related to the size of the market (larger states should have less variability in the unit price ratio across time due to the law of large numbers). Eq. (2) was estimated using a probit regression where we include year fixed effects only as few states switch regulatory regimes over the sample period. Finally, Eq. (3) was estimated by multinomial logit using data on all insurance regulators during their final year in office (note – we lose some regulators that were reported in Table 2 because of the lagged independent variables used to estimate Eq. (3)).

5. Regression results

Table 3 shows the summary statistics of our political and economic variables for regulated (prior approval) and unregulated states. It also shows the statistical test for differences in means. On average the premium ratio for regulated states (1.191) is similar to the ratio in unregulated states (1.194), but the average loss per car and the average premium per car are significantly higher in regulated states than unregulated states. Regulated states have a higher percentage of car years in the residual market, but fewer cars covered. Further, regulated states have a higher percentage of liability losses, but a lower percentage of premiums written by direct writers. Regulated states are more likely to have an elected commissioner, are likely to have more liberal political ideologies, have a higher population density, and have a higher percentage of miles driven in urban areas.

Although the primary reason we estimate the reduced form multinomial regression is to control for possible endogeneity between insurance prices and the post-employment choices of regulators, the results, shown in Table 4, are none-the-less interesting. For example, the marginal effects portion of the table suggests the prior professional and educational background of the regulator is predictive of the employment choice they will make upon separation. For example, we find a large and significant negative tendency for commissioners to make a lateral move into government if they came from the private sector before their time as commissioner. Likewise, we find a negative tendency for insurance regulators to enter the private sector if they spent any significant amount of time as a legislator at either the state or national level prior to acquiring the job of insurance commissioner. Finally, we find a positive relationship between people with law degrees and the choice to enter the insurance industry after leaving office, the opposite effect of legal education on the incentive to make lateral moves into government, and a positive relationship for commissioners to enter private industry who

Table 3
Summary statistics regulated vs. unregulated states: 1985–2002

Variable	Regulated states				Competitive states				T-test $\mu_{reg} = \mu_{comp}$
	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max	
Unit price ratio	1.191	0.062	0.863	1.346	1.194	0.065	0.937	1.648	0.462
Ave. loss per car year (\$2004)	\$688.12	\$188.24	\$343.76	\$1352.31	\$607.41	\$148.28	\$347.05	\$1073.36	6.317***
Ave. prem per car year (\$2004)	\$816.97	\$215.85	\$429.56	\$1575.53	\$721.29	\$164.83	\$438.75	\$1243.13	6.605***
Percent car years in residual market	6.12%	12.27%	0.00%	72.73%	0.83%	2.19%	0.00%	29.30%	7.880***
Total written car years (000's)	2767	2475	240	9653	3440	3465	285	20,236	2.984***
Percent liability losses incurred in no-fault	8.86%	9.00%	-4.66%	37.64%	8.33%	14.27%	-0.41%	68.43%	0.597
Percent losses incurred in liability coverages	71.39%	7.56%	46.10%	87.64%	69.04%	5.85%	50.43%	82.27%	4.629***
Percent premiums by direct writers	62.10%	12.86%	20.66%	83.25%	63.93%	12.30%	26.98%	83.26%	1.936*
Percent private sector employees in ins. ind.	1.89%	0.58%	0.68%	4.77%	1.87%	0.65%	0.89%	4.66%	0.495
Percent state GDP from insurance	2.40%	1.26%	0.67%	9.76%	2.37%	1.38%	0.52%	10.04%	0.346
Percent of national insurance GDP from state	2.02%	2.28%	0.10%	12.48%	2.45%	2.79%	0.05%	12.53%	2.216**
Indicator = 1 if commissioner is elected	0.293	0.456	0.000	1.000	0.105	0.307	0.000	1.000	6.410***
Liberal ideology index	54.064	24.087	0.000	97.917	45.466	25.142	0.000	96.371	4.647***
Real per capita income (\$2004)	\$28,688	\$4553	\$19,177	\$42,152	\$27,840	\$4291	\$19,818	\$45,585	2.549**
Population density	256.78	313.98	0.96	1148.53	120.74	141.51	4.68	700.38	7.368***
Percent miles driven in urban areas	56.04%	17.06%	24.44%	87.57%	50.05%	15.92%	21.43%	80.95%	4.821***
Poverty rate	12.33%	3.90%	3.70%	25.50%	12.14%	3.09%	2.90%	22.90%	0.726

Table displays summary statistics of the political, economic, and other characteristics of the personal automobile insurance market in states with price regulation versus states that allow the competitive market forces to determine prices. The unit price ratio is defined as direct premiums earned in the state divided by the sum of direct losses incurred, direct loss adjustment expenses, and policyholder dividends paid. The lines of insurance included are personal automobile liability, no-fault automobile liability, and personal automobile physical damage. We exclude all state-year observations without complete data or those observations where the insurance regulator did not make a post-tenure career choice either because the regulator was still in office in 2002 or because the regulator died or was indicted while in office.

Note: There are 363 unregulated and 345 regulated state-year observations. ***, **, * denotes statistical significance at the 1%, 5% and 10% levels, respectively.

come from states with large insurance markets (relative to the national market).

The unit price ratio regression results for all states and all years are shown in Table 5. In each regression we included both year and state fixed effects but, to conserve space, we do not report the statistics in the table. The column labeled “Model 1” reports results where we treat the choice of regulatory regime as exogenous and where we ignore the professional experience and post-agency employment choices of the regulators. Thus, Model 1 is comparable to the majority of the previous literature which investigates the effect of rate regulation on insurance markets (e.g., Harrington, 2002). In the column labeled “Model 2” we report results where we include information on the regulator’s background and future employment choices but where we still do not attempt to control for any potential selection biases. In Models 3 and 4 we include the inverse mills terms to control for the possibility the choice of regulatory regime is endogenous or for potential endogeneity between future employment choices and the price of automobile insurance, respectively. Model 5 is our most fully specified model as we include both sets of inverse mills terms.

The first conclusion we make relates to the issue of selectivity bias from either the joint determination of rate regulation and insurance prices or the joint determination of post-agency employment choices by regulators and insurance prices. From Table 5 we see the *F*-statistic on the test that the inverse Mills ratio terms for regulated and unregulated states are jointly equal to zero is only 0.04 in Model

3 and 0.69 in Model 5. Neither test is statistically significant. Thus, unlike the conclusion reached in Cummins et al. (2001), and more similar to the conclusion reached by Harrington (2002), our results suggest treating the prior approval indicator as an exogenous variable leads to unbiased results.

The story is different regarding the selectivity bias of the future employment choices of regulators and the price of automobile insurance. In this case we see that all of the employment choice inverse Mills ratio terms are individually statistically significant and the *F*-statistic testing the hypothesis that all five terms are jointly equal to zero is rejected at the 1% confidence level. Thus, we have strong evidence the price of insurance and the future career choices of regulators are determined jointly. This result provides evidence that the private incentives of the regulators impact the decisions they make while serving out their term in office. It also suggests that a potentially significant bias exists in the types of models which have generally been employed to examine the effects of regulation on state auto insurance markets.¹⁵

Turning now to the regression results we see little evidence rejecting the null hypothesis that price regulation,

¹⁵ The set of excluded instruments used in the first-stage multinomial logistic regression meet the overidentifying restrictions for Model 4. A Hausman test failed to reject the null hypothesis of exogeneity of the excluded instruments for Model 4. The test statistic 1.17 distributed *F*(9, 624) has a *p*-value greater than 30%. The results of the Hausman test for Model 5 provide similar results.

Table 4
Multinomial regression results of post-employment choice: 1985–2002

	Lateral move into gov't	Seek higher political office	Private sector – insurance	Private sector – not insurance
<i>Panel A: regression results variable/post-employment choice</i>				
Intercept	–1.661 (2.051)	–4.019 (2.948)	0.298 (1.838)	–2.180 (2.072)
Graduate from law school	0.854 (0.958)	3.090*** (1.188)	1.909** (0.881)	0.935 (0.973)
Degree from graduate school	1.298 (1.204)	2.478* (1.361)	1.312 (1.136)	1.700 (1.193)
Male	0.395 (0.886)	–0.708 (1.026)	0.536 (0.816)	0.335 (0.928)
Mixture gov't and private sector	0.329 (1.255)	3.058* (1.703)	0.884 (1.221)	0.772 (1.325)
Career politician	–1.736 (1.229)	3.616** (1.664)	–1.212 (1.151)	–1.696 (1.506)
Prior industry	–3.466*** (1.326)	–0.421 (1.731)	–0.499 (0.879)	–0.325 (0.985)
Percent state GDP from insurance	–2.585 (40.319)	–91.258 (61.115)	–9.157 (33.983)	17.068 (35.380)
Percent of national insurance GDP from state	9.113 (26.537)	–0.884 (30.017)	25.947 (25.226)	19.628 (26.461)
Ave. size of the residual market final two years in office	–7.756 (6.508)	–9.876 (13.352)	–1.755 (4.874)	–3.121 (5.671)
Ave. loss per car in state to ave. loss per car in nation	2.680 (1.998)	2.861 (2.374)	0.412 (1.874)	1.482 (2.043)
Log likelihood function value	–174.190			
Pseudo R-squared	19.06%			
<i>Panel B: marginal effects variable/post-employment choice</i>				
Graduate from law school	–0.103*	0.038	0.218***	–0.086
Degree from graduate school	–0.011	0.036	–0.036	0.052
Male	–0.004	–0.036	0.072	–0.012
Mixture gov't and private sector	–0.072	0.098	0.016	–0.012
Career politician	–0.125***	0.622***	–0.390**	–0.117**
Prior industry experience	–0.257***	0.007	0.151	0.062
Percent state GDP from insurance	0.501	–1.974	–2.104	3.332
Percent of national insurance GDP from state	–1.784	–0.500	3.315*	–0.161
Ave. size of the residual market final two years in office	–0.732	–0.159	0.785	–0.019
Ave. loss per car in state to ave. loss per car in nation	0.265**	0.044	–0.345*	0.077

Table displays the results of a multinomial logistic regression of the regulator's first employment choice following his tenure as insurance commissioner. Panel A displays the regression results of the multinomial logistic model $\text{Prob}(\text{Employment Choice}_y)/\text{Prob}(\text{Retired}) = f(\text{tenure, prior employment choice variables, size of the insurance market, and performance of automobile insurance market variables})$. Panel B displays the marginal effects of the explanatory variables on the probability the insurance commissioner chooses employment type y following his tenure as commissioner. The marginal effects for the continuous variables shows the estimated increase in the probability the commissioner chooses employment choice y for a 1% increase in the explanatory variable. The marginal effect for the categorical indicator variables shows the estimated increase in the probability the commissioner chooses employment choice y when the indicator switches from 0 to 1. We include all observations except regulators who were still in office in 2002 or those who died or resigned while in office. There are 164 observations.

***, **, * denotes statistical significance at the 1%, 5% and 10% levels, respectively. Standard errors are reported in parentheses.

by itself, has a significant impact on the price of insurance in regulated states relative to competitive market outcomes. Consider, in Model 1 when we do not include the regulator variables, the estimated coefficient on the prior approval rate regulation indicator variable was only 0.017 suggesting prior approval state had slightly higher insurance prices over our sample period. Although marginally significant, the economic significance of the result is fairly small and is therefore consistent with the prior literature which, on average, finds very little impact of rate regulation on the resulting price of insurance.

The conclusion of little average overall impact of rate regulation on insurance prices is strengthened after we con-

trol for the backgrounds and future employment choices of the regulators. In all models where we include the prior and post-professional experience of the regulators, the estimated coefficient on the prior approval indicator variable is never statistically different than zero. Of all models shown in Table 5, our preferred specification is Model 4 where we treat the regulatory regime exogenously but control for the self-selection bias regarding the *ex post* employment choices of the regulators. Focusing on Model 4, the estimated coefficient on the prior approval rate regulation dummy variable is 0.008 and not statistically different than zero providing further evidence that rate regulation had little impact on average insurance prices over our time

Table 5
Premium ratio regression results: 1985–2002

Price regulation treated as endogenous	No	No	Yes	No	Yes
Post employment choice of regulator treated as endogenous	No	No	No	Yes	Yes
Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	2.298*** (0.438)	2.146*** (0.430)	2.147*** (0.432)	1.914 (0.440)	1.964 (0.442)
Percent liability losses incurred in no-fault coverage	-0.578*** (0.070)	-0.598*** (0.069)	-0.597*** (0.069)	-0.581 (0.069)	-0.587 (0.070)
Percent losses incurred in liability coverages	0.839*** (0.051)	0.853*** (0.051)	0.854*** (0.051)	0.870 (0.051)	0.872 (0.051)
Percent premiums by direct writers	-0.195*** (0.042)	-0.153*** (0.041)	-0.151*** (0.042)	-0.182 (0.040)	-0.193 (0.040)
Ave. loss per car in state to ave. loss per car in nation	-0.143*** (0.018)	-0.134*** (0.017)	-0.134*** (0.017)	-0.125 (0.018)	-0.122 (0.018)
Log(written car years)	-0.100** (0.033)	-0.091*** (0.032)	-0.092*** (0.032)	-0.072** (0.033)	-0.076** (0.033)
Prior approval indicator	0.017* (0.010)	0.001 (0.017)	0.004 (0.019)	0.008 (0.022)	0.004 (0.023)
Prior approval × consumer advocate	-0.044*** (0.016)	-0.051*** (0.016)	-0.050*** (0.016)	-0.057*** (0.016)	-0.060*** (0.016)
Prior approval × elect	0.032 (0.022)	0.053** (0.022)	0.052** (0.023)	0.044** (0.022)	0.050** (0.023)
Prior approval × prior mix gov't and private sector		-0.005 (0.008)	-0.005 (0.008)	0.001 (0.008)	0.002 (0.008)
Prior approval × prior politician		0.022** (0.009)	0.023** (0.009)	0.015 (0.009)	0.014 (0.009)
Prior approval × prior insurance industry		-0.013 (0.009)	-0.013 (0.009)	-0.009 (0.009)	-0.009 (0.009)
Prior approval × private sector other industries		-0.018* (0.010)	-0.018* (0.010)	-0.011 (0.010)	-0.011 (0.010)
Prior approval × probability post lateral move to gov't		-0.005 (0.015)	-0.005 (0.015)	0.006 (0.022)	0.007 (0.022)
Prior approval × probability post seek higher office		0.063*** (0.015)	0.063*** (0.015)	0.069*** (0.023)	0.072*** (0.024)
Prior approval × probability post private sector ins.		0.017 (0.013)	0.017 (0.013)	0.010 (0.020)	0.011 (0.020)
Prior approval × post private sector other than ins.		0.008 (0.015)	0.008 (0.015)	0.005 (0.021)	0.005 (0.021)
Regulated inverse mills ratio			-0.002 (0.009)		0.011 (0.008)
Unregulated inverse mills ratio			-0.002 (0.011)		-0.003 (0.009)
Post lateral move to gov't inverse mills ratio				-0.015*** (0.005)	-0.015*** (0.005)
Post seek higher office inverse mills ratio				-0.013** (0.006)	-0.014** (0.006)
Post private industry insurance inverse mills ratio				-0.024*** (0.007)	-0.024*** (0.007)
Post private industry other than ins. inverse mills ratio				-0.011** (0.005)	-0.010** (0.005)
Other post-employment inverse mills ratio				-0.006 (0.007)	-0.006 (0.007)
R-squared	0.668	0.698	0.699	0.706	0.706
<i>F-statistics for selectivity tests</i>					
$\beta_{\text{Regulated}} = \beta_{\text{Unregulated}} \text{ IMR} = 0$			0.040		0.690
$\beta_{\text{Post bureaucrat}} \text{ IMR} = \beta_{\text{Post higher office}} \text{ IMR}$				3.230***	3.310***
$= \beta_{\text{Post insurance industry}} \text{ IMR} = \beta_{\text{Post other industry}} \text{ IMR} = 0$					
<i>Estimated effect of prior approval regulation by regulator type</i>					
$\beta_{\text{Prior approval}} + \beta_{\text{Prior approval} \times \text{prior mixed public-private}} = 0$	-0.004	-0.001	0.009	0.006	
$\beta_{\text{Prior approval}} + \beta_{\text{Prior approval} \times \text{prior politic}} = 0$	0.023	0.026*	0.023	0.018	
$\beta_{\text{Prior approval}} + \beta_{\text{Prior approval} \times \text{prior insurance industry}} = 0$	-0.012	-0.010	-0.001	-0.005	
$\beta_{\text{Prior approval}} + \beta_{\text{Prior approval} \times \text{prior other industry}} = 0$	-0.017	-0.014	-0.003	-0.007	

Table 5 (continued)

Price regulation treated as endogenous	No	No	Yes	No	Yes
Post employment choice of regulator treated as endogenous	No	No	No	Yes	Yes
Variable	Model 1	Model 2	Model 3	Model 4	Model 5
$\beta_{\text{Prior approval}} + \beta_{\text{Prior approval} \times \text{post lateral move to gov't}} = 0$	-0.004	-0.001	0.014	0.012	
$\beta_{\text{Prior approval}} + \beta_{\text{Prior approval} \times \text{post higher office}} = 0$	0.064***	0.066***	0.077***	0.076***	
$\beta_{\text{Prior approval}} + \beta_{\text{Prior approval} \times \text{post private sector insurance}} = 0$	0.018*	0.021	0.018*	0.015	
$\beta_{\text{Prior approval}} + \beta_{\text{Prior approval} \times \text{post private sector other than ins.}} = 0$	0.004	0.003	0.006	0.007	
$\beta_{\text{Prior approval}} + \beta_{\text{Prior approval} \times \text{consumer advocate}} = 0$	-0.050**	-0.047*	-0.049*	-0.055**	
$\beta_{\text{Prior approval}} + \beta_{\text{Prior approval} \times \text{elected commissioner}} = 0$	0.054**	0.056**	0.052*	0.055*	

Table displays premium ratio regression results where we treat the regulatory regime and/or the post-employment choices of the regulators as either being determined exogenously or endogenously. We use Heckman's two-stage estimation methodology to control for the potential endogeneity. The models are estimated using weighted least squares where we control for heteroskedasticity related to the size of the state market using the square root of insured car years. All models are estimated including state and year indicator variables to control for cross sectional and year specific fixed effects. Our sample includes all state-year observations where we have complete data except we exclude observations where the regulator died or was indicted while in office or if the regulator was still in office in 2002. There are 708 state-year observations.

***, **, * denotes statistical significance at the 1%, 5% and 10% levels, respectively. Standard errors are reported in parentheses.

period. Thus, the legal authority for an insurance regulator to oversee prices, in and of itself, does not appear to significantly impact insurance prices in regulated versus unregulated states.

Although the overall impact of regulation appears to be negligible, we do find evidence that the regulators' post-regulatory employment aspirations had a large impact on the price of insurance while they were in office. Perhaps the largest effect we report is for commissioners who sought higher office after they left the insurance department. As shown in the lower panel of Table 5, the sum of the estimated coefficient on the prior approval indicator plus the coefficient on the post-employment higher office in regulated states indicator is $0.008 + 0.069 = 0.077$. Thus, we estimate the unit price of insurance in regulated states when the commissioner sought higher elective office is approximately 6.5% higher than what we would expect from a competitive state with similar characteristics.¹⁶ The result is consistent with the hypothesis insurance commissioners use their position to gain favor with the industry, presumably, in return for political support during future campaigns.

Avowed consumer advocates also have a large impact on the price of automobile insurance although the effect is in the opposite direction. The estimated coefficient on the consumer advocate indicator is always negative and highly significant. In addition, the coefficient of the prior approval regulation indicator plus the coefficient on the consumer advocate dummy variable is $0.008 - 0.057 = -0.049$ which is marginally significant at the 10% level. Thus, we find evidence consistent with anecdotal stories that consumer advocates take office and aggressively work to push down the price of insurance – possibly below what would otherwise be the competitive market outcome.

A result contrary to our expectations involves regulators in price regulated states who obtain the position of insurance commissioner via popular election as the coefficient on the elected commissioner dummy variable is positive and significant in Model 4. In addition, the total effect of elected commissioners in price regulated states, obtained by adding the coefficient on the elected dummy variable and the prior approval regulation indicator ($0.044 + 0.008 = 0.052$), is still statistically different than zero although only at the 10% level. This result is the opposite of the negative relationship we expected based upon the theoretical work of Besley and Coate (2003) and at odds with the majority of the empirical research cited earlier in this paper (Besley and Coate, 2003; Smart, 1994; Formby et al., 1995).

One reason which might explain our result concerns an important institutional difference between insurance regulation versus public utility regulation. State public utility commissions are composed of multiple commissioners and the size of the board typically ranges from three to seven commissioners. In contrast, the number of commissioners who exercise authority over insurance rate regulation is generally one. This difference may be important as Formby et al. hypothesize elected regulators will become more pro-consumer as the size of the commission increases. They develop this hypothesis by positing it becomes more difficult for the industry to structure side payments and monitor individual commissioner's behavior on larger more complex agencies.¹⁷ Thus, although firms in the industry still have a direct incentive to influence the regulatory process, the

¹⁶ We calculated the estimated percentage increase in price by taking the estimated effect, 0.077, and dividing by the average premium ratio in competitive states over this time period, 1.194 (shown in Table 3).

¹⁷ This same hypothesis can also be obtained using the theoretical work of Laffont and Martimort (1999) who demonstrate that allocating regulatory power to multiple regulators can be an effective mechanism against regulatory capture. However, the rationale for the Laffont and Martimort result is a bit different as the social benefit of multiple regulators overseeing the activities of a regulated firm is the reduced discretion that any one regulator has to use the private information they learn through the regulator process.

marginal cost of doing so increases as the size of the public utility commission increases. Consistent with this hypothesis, the authors report a negative and significant relationship between the size of the public utility commission and the likelihood the regulated utility has a lower bond rating. This is consistent with regulators on larger boards favoring consumers and reducing the firm's profit margin.

Using similar reasoning, since insurance commissioners have monopoly power over any private information they learn through the regulatory process, it is quite possible the marginal cost of influencing the insurance regulator becomes low enough such that the industry is successful capturing the attention of the regulator. Our results are consistent with insurance commissioners feeling less constrained to show leniency to the industry in return for future political support since no other state official is likely to learn the true profitability of the industry. It is also interesting to note that commissioners whose post-employment aspirations are to seek higher political office overwhelmingly are more likely to obtain the position of insurance commissioner by popular election. Of the 164 observations where we have data on the post industry choices of the regulator, 65% of regulators who sought higher office after their tenure obtained the position of commissioner by election. Of commissioners who did not seek higher political office after leaving their post, only 8% of these commissioners obtained the position by election. Thus, the evidence reported here is consistent with elected regulators approving rate filings that lead to higher prices than would be expected in similarly structured states with competitive rating laws. This conclusion is strengthened when one also considers the other important price effect we found in this study is for regulators who subsequently sought higher office. There exists a strong correlation between regulators having prior experience in elections and whose post-agency career aspirations are higher political office.

Regarding the revolving door between government and the private sector, we do find evidence that the net effect on prices is marginally higher in prior approval states where the insurance commissioner migrates to the insurance industry following his tenure in office but no evidence of higher prices for regulators who choose some other industry upon leaving office. Although marginally statistically significant, economically the increase in prices appears to be fairly small. Using the coefficients from Model 4, we estimate the increase in price for commissioners who later obtained positions in the insurance industry to be 1.5%.¹⁸ Thus, we find some evidence consistent with the hypothesis that regulators who pass through the revolving door are more lenient during the rate setting process. However, our result is more consis-

tent with Che's prediction that regulators will continue to aggressively regulate the industry while in office to demonstrate qualifications the industry may find useful once they step down.

The results of the economic and market structure variables are largely consistent with our prior expectations and the previous literature. We find evidence that states with more no-fault insurance have lower premium ratios consistent with the hypothesis that no-fault claims are less costly to administer and no-fault laws reduce the uncertainty associated with the insurer's loss potential and therefore require less capital to successfully underwrite. In a similar way, states with a greater percentage of losses paid in third party liability lines of insurance are estimated to have higher unit price ratios consistent with the hypothesis that liability claims are more risky, relative to physical damage claims, and therefore require more capital to successfully underwrite. The percentage of premiums written by companies using exclusive agents is negatively related to average prices consistent with the hypothesis direct writers have a cost advantage relative to companies that rely upon independent agents to distribute their products. Finally, consistent with Harrington (2002) we find the hypothesized negative relationship between the size of the average loss per vehicle and price ratios consistent with there being fixed costs and/or marginal production expenses that do not increase as quickly as expected claim costs increase.

6. Conclusions

In this paper we are concerned with the effects of price regulation on state auto insurance markets. The previous literature suggests quite strongly that so-called prior approval rate regulation is not systematically related to auto insurance prices. Sometimes the relationship between regulation and prices is positive, sometimes it is negative, and depending on the models or the time period studied, it may not be significant. In this paper we examine two sources of selectivity which may bias the results. The first has to do with the type of regulatory environment selected (prior approval or competitive market) and the second has to do with the incentives of the regulator to choose a regulatory style that enhances the possibility of post-agency employment in the private sector, government service or in higher office.

We were also interested in providing insight into the potential of a revolving door between regulators and industry. When regulators take positions with the regulated industry it is often presumed that this is bad for consumers because of the generally unstated assertion that the industry is providing future employment as a payment for previous regulatory behavior. While the literature suggests that there may be socially optimal reasons to allow post-agency employment in the regulated industry, there is often a general presumption by observers that permitting the revolving door lowers social welfare.

¹⁸ The estimated percentage increase in price was calculated by adding the estimated coefficient on the prior approval dummy variable together with the post industry employment indicator, $0.008 + 0.010 = 0.018$, and dividing by the average premium ratio in competitive states over this time period, 1.194 (shown in Table 5).

Consistent with prior research, our results suggest that prices are, on average, neither higher nor lower in prior approval states versus states with competitive rating laws. However, this paper presents evidence which suggests one of the reasons prior researchers typically conclude regulation has very little effect on prices is because the authors failed to control for the career motivations of the insurance commissioners themselves. Specifically, once we control for the professional background of the insurance commissioners, we do find strong evidence that prices in regulated environments can differ significantly from what we would otherwise expect to see in a similarly situated state where competition is the primary determinant of prices. For example, we find some evidence that insurance commissioners who describe themselves as avowed consumer advocates are successful reducing the price of insurance in favor of consumers in regulated states. In addition, we find strong evidence the price of automobile insurance in states with regulators who seek higher political office following their tenure as insurance commissioner is statistically and economically higher in regulated states relative to states where competition is the primary determinant of equilibrium prices. Likewise, prices are also significantly higher in states with regulators who obtain the position of insurance commissioner by popular election. Although the statistical significance of the latter result is a bit weaker, both results are consistent with insurance commissioners who aspire for political careers using the private information they learn through the regulatory process and allowing the industry to price above marginal cost in return for past and future political support.

We find similar evidence for regulators who migrate to the insurance industry following separation although the result is of much lower economic significance. Thus, we find some evidence consistent with the hypothesis that regulators who pass through the revolving door to industry appear mildly lenient during the rate setting process but not overly so. The result is consistent with Che's (1995) prediction that regulators will continue to aggressively regulate the industry while in office to demonstrate qualifications the industry may find useful once they step down.

Generally, the supposition is that *revolving door to industry* is where the problems arise. However, the largest price effects we found in this study is for elected regulators and, in particular, those who sought higher office after they left the insurance department. These results are consistent with the hypothesis insurance commissioners use their position to gain favor with the industry presumably in return for political support during election campaigns. From a policy perspective, our analysis call into question the fairly well accepted hypothesis that elected public officials will always be more pro-consumer relative to those who obtain their position of authority via appointment. Our results, considered in light of previous theoretical and empirical work

(most notably Formby et al., 1995), suggest it is also important to ensure regulators do not have monopoly power over the private information they obtain via the regulatory process. Given that some states will continue to find it desirable to regulate insurance prices, having multiple overseers of rates may reduce the potential for collusive behavior between the regulator and the industry at the expense of consumers.

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Appendix A. Types of rating laws by state, 1972–2005

Table displays for the rating law in force for each state. Sources: Harrington (2002) and American Insurance Association (2005) see Table A.1.

Code	Description of the rating law		
1	State-made rates		
2	Prior approval without a deemer provision		
3	Prior approval with a deemer provision ^a		
4	File-and-use (file on or before effective date)		
5	Use-and-file (file within specified period after effective date)		
6	Filing only (no time period specified)		
7	Flex rating (prior approval of change outside of permissible range)		
8	File-and-use or use and file in a competitive market		
State	Rating law 1	Rating law 2	Rating law 3
Alabama	3:1972–2005		
Alaska	3:1972–2005	3:2005	
Arizona	3:1972–1980	5:1981–2005	
Arkansas	3:1972–1979	4:1980–2005	
California	6:1972–1988	3:1989–2005	
Colorado	5:1972–1983	4:1984–2005	
Connecticut	3:1972–1983, 1994–1999	4:2000–2005	
Delaware	2:1972–2005		
Florida	3:1972–1974, 1987–2005	4:1975–1986	

(continued on next page)

Appendix A (continued)

State	Rating law 1	Rating law 2	Rating law 3
Georgia	4:1972–1987	3:1988–2005	
Hawaii	3:1972–2005		
Idaho	5:1972–2005		
Illinois	5:1972–2005		
Indiana	4:1972–2005		
Iowa	3:1972–1987	8:1988–2005	
Kansas	3:1972–2005		
Kentucky	3:1972–1982	8:1983–2005	
Louisiana	3:1972–2003	7:2004–2005	
Maine	3:1972–2005		
Maryland	3:1972–1984, 1990–1998	4:1985–2005	
Massachusetts	1:1972–2005		
Michigan	3:1972–1980	8:1981–2005	
Alabama	3:1972–2005		
Minnesota	4:1972–2005		
Mississippi	3:1972–2005		
Missouri	5:1972–2005		
Montana	6:1972–2005		
Nebraska	3:1972–2005		
Nevada	4:1972–1989	2:1990–2005	
New Hampshire	2:1972–2003	3:2004–2005	
New Jersey	2:1972–2003	7:2004	
New Mexico	3:1972–1975, 1988–2005	4:1976–1987	
New York	4:1972	2:1973–1995	7:1996–2005
North Carolina	2:1972–1976	3:1977–2005	
North Dakota	3:1972–2005		
Ohio	4:1972–2005		
Oklahoma	3:1972–2005		
Oregon	4:1972–2005		
Pennsylvania	3:1972–2005		
Rhode Island	3:1972–2005		
South Carolina	3:1972–1998	7:1999–2005	
South Dakota	3:1972–1979	8:1980–2005	
Tennessee	3:1972–2005		
Texas	2:1972–2003	4:2004–2005	
Utah	3:1972	5:1973–2005	
Vermont	3:1972–1984	8:1985–2005	
Virginia	3:1972–1973	4:1974–1989	8:1990–2005
Washington	3:1972–2005		
West Virginia	3:1972–2005	3:2005	
Wisconsin	5:1972–2005	5:2005	
Wyoming	3:1972–1983	8:1984–2005	

^aRates are deemed approved if no regulatory action within a specified period; includes states that required prior approval of deviations from bureau rates and Alabama's modified prior approval law, which requires prior approval of changes in expense and profit loadings.

Table A.1

Probit regression results of the choice of regulatory regime: 1985–2002

Variable	
Intercept	0.035 (0.905)
Percent private sector employees in insurance industry	-41.069*** (12.020)
Ave. loss per car in state to ave. loss per car in nation	0.351 (0.377)
Lagged(percent car years in residual market)	6.617*** (1.283)
Lagged(percentage increase in ave. loss per car)	1.115 (0.721)
Percent premiums by direct writers	-1.172* (0.621)
Indicator = 1 if commissioner is elected	1.200*** (0.142)
Percent liability losses incurred in no-fault coverage	-0.757 (0.512)
Liberal ideology index	0.007*** (0.003)
Real per capita income (\$2004)	0.000 (0.000)
Population density	0.001*** (0.000)
Percent miles driven in urban areas	1.327*** (0.446)
Poverty rate	0.009 (0.022)
Log-likelihood function value	-448.82
Pseudo R-squared	20.84%

Table displays rate regulation probit regressions result estimated using maximum likelihood. The dependent variable is an indicator equal to 1 when the state has prior approval or state-made rate regulation and 0 otherwise. We include all states with valid observations over the time period 1985–2002 except the District of Columbia.

***, **, * denotes statistical significance at the 1%, 5% and 10% levels, respectively.

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