

# 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 provides 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 evidence that consumers in prior approval states paid significantly higher “unit prices” for insurance than consumers in states that allow competitive market forces to determine equilibrium prices during the time period 1985 – 2002. Furthermore, we find evidence that regulators who seek higher elective office following their tenure as insurance commissioner or those who desire private industry jobs allow the highest 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. Overall the results are consistent with there being asymmetric information in the regulatory process that insurance commissioners use to enhance their career aspirations.

## 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-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 to suppress rates. In a similar vein, Cummins, Phillips and Tennyson (2001) also suggest price regulation has a disparate impact depending upon the state. Unfortunately there is very little research to suggest why price regulation appears to have differential impacts in some states and/or for only certain periods of time even though over the long run the mean effect appears to be close to zero.

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

We investigate the environment for insurance from a number of perspectives. First we examine for 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 by considering the regulators' career incentives themselves. Most of the previous literature focuses on incentives facing regulators in multi-commissioner agencies. We are able to look at the insurance regulator, which is traditionally, a single commissioner agency. Further, we focus on automobile price regulation which differs among the states. Some states 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 regulatory incentive differences between states with various degrees of pricing setting authority.

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 5.

## **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 firm, 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 has with the industry. For example, Laffont (1994) summarizes the principal-agent literature and its application to regulatory behavior and 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 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.<sup>1</sup> Congress and some of the states have also passed laws restricting others from lobbying their former agencies.<sup>2</sup>

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<sup>1</sup> 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/excorders/eo13184.pdf](http://www.usoge.gov/pages/laws_regs_fedreg_stats/lrfs_files/excorders/eo13184.pdf).

<sup>2</sup>The Congressional prohibitions contain a permanent two year prohibition for representational activities for items within the officials official responsibility while in office, a prohibition to represent anyone who has an interest in an action that the official participated in while in office, a prohibition to switching sides (for example the attorney

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, *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. For the first two cases, collusion is not possible between the regulator and the firm. 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. If the firm can not observe the regulator's qualifications and 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.

The third case allows for 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 can not 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 future time period. 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 efficiency gains. Thus, the revolving door issue is one of considerable interest in the design of political institutions and in the rules that govern administrative procedures.

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general could never represent someone on the other side of a case he oversaw while he was AG), and a prohibition for 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.

A number of interesting empirical analyses of pre- and post-agency employment effects exist in the literature. In the political science literature we see researchers looking 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 (Gormely, 1979 and Cohen, 1986). More recently, researchers are attempting to see if there are other types of evidence of the revolving door using other approaches. Gely and Zardkoochi (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 Bush (I), 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 further empirical paper looks at the performance of U.S. 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" get 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 (Viscusi, Grabowski, and Evans (1987), Harrington (2001) and Cummins, Phillips and Tennyson (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.<sup>3</sup>

Harrington empirically examines (by year) the effect of prior approval regulation on private passenger auto rates. A priori, one might expect that 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 Figure 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.

We will examine the choice by the state for selection of the insurance commissioner to see if the appointment influences the effect of regulation on the market. Some 22 percent 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.

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<sup>3</sup> 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 Appendix A) as a prior approval law.

Besley & Coate (2003) compare direct election of regulators to the political appointment of regulators. As they note, it seems self-evident that elected commissioners are going to be more closely aligned with voters' interests, but the appointed commissioners are, in turn, appointed by elected officials. So, is there truly a difference between 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 policy 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 on the part of 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. Consistent with this hypothesis Besley and Coate examine a panel on energy prices at the state level and they find evidence of elected commissioners being associated with lower prices.

We have two strands of literature we can 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 the 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.

## DATA & HYPOTHESIS DEVELOPMENT

We undertake to examine the effect of a number of variables on the price of automobile insurance across state insurance 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.

We collected regulator biographical detail from the National Conference on 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 that were in office from 1985-2002. In our analysis we eliminate 10 regulators that were in office for only a short period of time as acting commissioners and 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 is for 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 insurance<sup>4</sup>; 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 percent) of the commissioners were deputies who took acting positions that lasted more than six months, but then later returned to the insurance commission. A second category of post-agency employment is for those who *sought* (successfully and unsuccessfully) *higher office*. A third category is for those who were subsequently employed in the *private sector in the*

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<sup>4</sup> For our empirical analysis we had to collapse some of our categories due to a multitude of categories. Thus, we collapsed private sector insurance and private sector other into a category we call prior private sector for our subsequent empirical analysis.

*insurance industry* while those that go to some other industry are classified as *private sector (other industry)*.<sup>5</sup> 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 the pre and post-agency employment we have data on the selection method (elected v. appointed), the type of price regulation used in the state (prior approval), length of tenure in office, whether the regulator is a self described consumer advocate, a lawyer, college graduate, and the gender of the regulator.

We use the NAIC's annual statement dataset for 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 numbers we were able to calculate the average loss per car per year and the average premium per car per 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.

We also 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.<sup>6</sup> We use the political 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 AM Best Key Rating guide. Previous research (Berger, Cummins, and Weiss, 1997) suggests that insurer that employ exclusive agency systems are lower cost providers and therefore their relative market share will influence statewide pricing.

We have two major hypotheses regarding how regulators price insurance within the state. What is unique about this study is that we control for possible *ex ante* and *ex post* incentives by the regulator and we specifically test by examining the marginal effects of the *ex ante* and *ex post* employment of the regulators. 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 for the moment that the revolving door imposes net costs on society, we can develop a set of hypothesis consistent with this conjecture. In terms of pre-

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<sup>5</sup> Again, we collapse the private sector post employment categories into one called post private sector.

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

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 obtaining 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. However, a lenient regulator may be able to extract future support. Thus, the expected sign on the coefficient for political agents is not determinable.

Someone from the with a mixed background (both careers in 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 for a connection to the governor or for management ability. To the extent that these are valuable qualities to the insurance industry or to any other industry, there may be a revolving door, but it is not clear if this benefits 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 some 47 percent take insurance industry positions after leaving office. This percentage of industry employment is consistent with other regulated industries (see e.g. Eckert, 1981 and 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 their work 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.<sup>7</sup> Thus, they are hypothesized to have no effect on insurance prices.

Finally, we have the base case. We aggregate the other categories together (died, missing, indicted) and this is our default category which we measure effects against.

We also have an indicator for whether the person is a self-declared consumer advocate. Something in the person's background such as previous employment or personal statements caused us to believe the person viewed themselves as consumer advocates. This is a conservative measure as we did not infer this status without specific evidence.<sup>8</sup> We expect that consumer advocates would have the effect of lowering prices in the state.

Table 1 shows the summary statistics of our political and economic variables for regulated (prior approval) and unregulated states for the state-year observations in our sample. It also shows the statistical test for differences in means. On average the premium ratio for regulated states (1.189) is similar to the ratio in un-regulated states (1.193), 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

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<sup>7</sup> 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.

<sup>8</sup> 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.

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 be more liberal, have a higher population density, have a higher percentage of miles driven in urban areas, and have a higher poverty rate.

Table 2 shows descriptive statistics concerning the regulators in the sample broken to show differences between regulated and unregulated states. We find there are more elected commissioners in the regulated sample. The results also suggest regulated states' commissioners tend to serve longer (by about 6 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 come from some private industry other than insurance. Finally, the last panel of the table shows that where regulators end up after their tenure as a regulator does not seem to differ (in a univariate sense) on whether the state is regulated or not.

Table 3 shows a transition matrix from the prior-position (the job or career held prior to becoming regulators) 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 (48%) go to the private sector after serving as the insurance commissioner which is suggestive of a revolving door. Another 13 percent go to the non-insurance private sector, and a further 13 percent take lateral moves into state government. The remaining sought higher office (7 percent), retired (6%), returned to a position in the insurance department (4 percent), left office under a legal or ethical cloud (3 percent), or are still in office (7 percent). Only one commissioner died before taking a new position.<sup>9</sup>

## 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:

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

where  $p_{it}$  = unit price of automobile insurance in state  $i$  in year  $t$ ,  
 $X_{it}^m$  = 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,

<sup>9</sup> We have evidence that some have died subsequently 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.

- $X_{it}^r$  = 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  $t$ ,  
 $PA_{it}$  = indicator variable equal to one if state  $i$  has a prior approval law in year  $t$  and zero otherwise,  
 $\gamma$  = estimated effect of prior approval rate regulation,  
 $\beta^m$  = vector of estimated coefficients for the market structure and economic environment in state  $i$  for year  $t$ ,  
 $\beta^r$  = vector of estimated coefficients for the regulator profile variables in regulated state  $i$  for year  $t$ ,  
 $\eta_i$  = state specific error term for state  $i$ ,  
 $\nu_t$  = year specific error term for year  $t$ , and  
 $\varepsilon_{it}$  = random error term for state  $i$  in year  $t$ .

There are two econometric problems that we needed to consider in order to estimate equation (1) correctly. First, Cummins, Phillips and Tennyson (2001) suggest and report evidence that the decision for a state to adopt rate regulation is jointly determined with the unit price of insurance. 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  $\gamma$  and  $\beta^r$ . 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 less aggressively regulate insurance prices or possibly allow prices that exceed what would otherwise be the competitive market outcome in the state. An avowed consumer advocate may garner increased stature with certain interest groups as she uses her position to more aggressively regulate insurance prices.

To control for these two possible sources of endogeneity, we estimate a selection adjusted version of equation (1) using a variant of Heckman's (1978) two-step estimation method. Specifically, we consider the following two selection equations:<sup>10</sup>

$$PA_i^* = A_i\theta + u_i \quad (2)$$

$$p_{ixy}^* = \log\left(\frac{\pi_{ixy}}{\pi_{ix0}}\right) = B_{ix}\alpha_y + \omega_{ixy} \quad (3)$$

- where  $PA_i^*$  = 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,  
 $A_i$  = vector of exogenous variables hypothesized to be related to the likelihood state  $i$  is a regulated state,  
 $B_{ix}$  = vector of exogenous variables hypothesized to be related to the employment choices of regulator  $x$  in state  $i$  following his tenure as insurance commissioner,  
 $\theta, \alpha_y$  = estimated coefficient vectors,  
 $u_i$  = is the error term from the regulation selection equation, and  
 $\omega_{ixy}$  = is the error term from the post employment choice selection equation.

<sup>10</sup> Time subscripts have been suppressed to simplify the exposition.

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  $\text{Cov}(u_i, \omega_{ixy}) = 0$ , than it can be shown that the selectivity bias in equation (1) can be corrected by including inverse mills ratios calculated using the results of estimating the two selection equations.<sup>11</sup> To see this, first define

$$\lambda_i^r = \frac{\phi(\mathbf{A}_i\boldsymbol{\theta})}{\Phi(\mathbf{A}_i\boldsymbol{\theta})}, \text{ and } \lambda_i^c = \frac{-\phi(\mathbf{A}_i\boldsymbol{\theta})}{1 - \Phi(\mathbf{A}_i\boldsymbol{\theta})} \quad (4)$$

where  $\lambda_i^r$  and  $\lambda_i^c$  are inverse mills ratio for regulated and unregulated states, respectively,  $\phi(\cdot)$  and  $\Phi(\cdot)$  are probability and cumulative normal distribution functions, respectively, and  $\boldsymbol{\theta}$  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  $y^{\text{th}}$  post employment choice. As shown in McFadden (1973),  $P_{ixy} = \exp(\mathbf{B}_{ix}\boldsymbol{\alpha}_y) / \sum_{a=1}^4 \exp(\mathbf{B}_{ix}\boldsymbol{\alpha}_a)$  where  $\boldsymbol{\alpha}_a$  is the vector of coefficients for post employment choice  $a$  obtained from a multinomial logit regression of equation (3) estimated using maximum likelihood estimation.<sup>12</sup> In our empirical work we consider four 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; and (4) the official retires, dies, or is still in office at the end of our data sample (year 2002).

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:

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

We can now make the necessary adjustments needed to estimate equation (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,  $e_i$  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 equal

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

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 equation (2) by probit and equation (3) by multinomial logit and then using the five inverse mills terms as additional regressors in equation (1).

The exogenous variables we include in the probit regression includes the market structure variables discussed earlier plus five additional instrumental variables to control for various political factors we

<sup>11</sup> Admittedly assuming the  $\text{Cov}(u_i, \omega_{ixy}) = 0$  is a strong assumption. We plan to relax this assumption in the next draft of the paper.

<sup>12</sup> Note, in order to get unique estimates for  $\alpha_y$ , the probabilities are calculated relative to a reference group which allows the corresponding coefficient vector to be set equal to zero.

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 adopt 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. Finally, we include a control for the percentage of the state's private sector labor force employed by the insurance industry and two controls for 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 (or, alternatively, we use data from year 2002 if they are still in office at the end of our sample period). The explanatory variables include the vector of prior professional experience indicator variables, a non-linear specification for the number of years the commissioner was in office, an indicator variable set equal to one if the commissioner has a law degree, and the average losses per vehicle in the state relative to the average losses per vehicle nationwide. We also include two variables designed to measure how well the automobile insurance market in the state performed during the commissioner's last two years in office relative to the nationwide market. The first variable equals the percentage of drivers in the state that received insurance in the involuntary market minus that same percentage calculated at the national level. Likewise we calculate the average unit price ratio in the state over the commissioner's last two years minus the average unit price ratio across all states. We do not have strong priors regarding the expected sign on the relative size of the involuntary market variable, but we do hypothesize a positive relationship between insurance prices and post employment in the insurance industry.

The second econometric issue we faced in this study is the potential that the percentage of the automobile insurance market served by the involuntary market mechanism in the state is jointly determined with the unit price of insurance.<sup>13</sup> As discussed earlier, if regulation holds prices below the competitive market clearing price, then it is likely that insurers will restrict supply and consumers will be forced into the involuntary market. However, if regulation leads to increased prices relative to the competitive outcome, then drivers may find the involuntary market an attractive alternative especially as residual market drivers often receive subsidies as the majority of involuntary market mechanisms operate at a loss (Grabowski, Viscusi and Evans 1989). Accordingly, we control for the possible endogeneity of price and the size of the residual market by estimating equation (1) using two stage least squares.<sup>14</sup>

In summary, we estimation equations (1) and (2) using data on all 50 states for all years 1985 – 2002 (we exclude the District of Columbia). After eliminating observations where we were unable to locate the prior or post employment choices of the regulators in office, we have 882 state/year observations (out of a possible 19x50=950 observations). We estimate equation (1) via weighted 2SLS including the five inverse mills terms. 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 loss ratio across time due to the law of large numbers). Equation (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, equation (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 equation (3)).

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<sup>13</sup> See Suponic and Tennyson (1998) for a theoretical discussion.

<sup>14</sup> The instruments we use to identify the first stage regression include the state's poverty rate, real per capita income, population density, and the percentage of miles driven in urban areas.

## REGRESSION RESULTS

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, looking at the marginal effects portion of the table, we find that the amount of time the insurance regulator is in office increases the likelihood the commissioner goes to private industry after he leaves office but this effect declines to zero after eight years in office. The result is consistent with Che (1995) who suggests regulators who desire post-agency employment in the industry will remain in office long enough to acquire the institutional knowledge and/or reputation with the industry that will maximize their employment prospects when they leave. Our result suggests the marginal benefit of acquiring additional knowledge becomes zero sometime during the commissioner's second term in office.

The effect of longer job tenure has the opposite impact on the tendency for those who seek higher office after they leave their post as insurance regulator as the estimated marginal effect is negative during the early years of the commissioner's tenure. Thus, our evidence suggests regulators who desire political careers following their time as insurance commissioner are likely to stay in the office for only a short period of time.

The results in Table 4 also suggest 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 private sector after leaving office. Taken together with the tenure result discussed previously, this last result suggests regulators with law degrees who stay for one or two terms find entering the private sector an attractive choice after they leave office.

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. All regressions shown in Table 5 were estimated using 2SLS to control for the possibility insurance prices are jointly determined with the size of the residual market in the state. 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 that 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 insurance regulator's background and future employment choices but where we still do not attempt to control for any potential selection biases. In Model 3 we include the inverse mills terms to control for the possibility the choice of regulatory regime is endogenous and, in the column labeled "Model 4", we report results where we add the inverse mills terms to control for potential endogeneity between post agency employment choices and the price of automobile insurance. Thus, Model 4 is our most fully specified model.

The regression results provide strong evidence the private motivations of insurance regulators had 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 equals 0.033 suggesting prior approval state had slightly higher insurance prices over our sample period. Although statistically 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 is quite a bit different after we control for the backgrounds and future employment choices of the regulators. In our most fully specified regression, Model 4, the estimated coefficient on the prior approval rate regulation dummy variable almost doubles and now equals 0.059. This suggests states

with rate regulation had higher average insurance prices over our time period. One possible reason why prices appeared to be higher is that the industry was more successful capturing the interests of regulators during our sample period than they have been over earlier time periods. It is difficult to measure regulatory capture but, presumably, when average costs are declining, the salience of the issue for consumers also declines. Thus, any pressure on the regulator to lower premiums may also decline. It is worthy to note that when measured on any number of different dimensions, the frequency and severity of automobile accidents, and therefore the expected loss costs to the insurance industry, was declining over much of our time period used in this study. For example, the U.S. Department of Transportation and the National Highway Traffic Safety Administration reports the number of personal automobile accidents that involved bodily injury dropped from 182 to 132 crashes per 100 million miles driven over the 10 year time period 1993 to 2003 – a 27 percentage point decrease (Insurance Information Institute, 2006). Our results suggest prices in regulated states may have declined even faster had it not been for the regulated rate setting process.<sup>15</sup>

In addition to finding evidence of higher prices in regulated states, we also find evidence that certain types of regulators 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 second part 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  $0.059 + 0.036 = 0.095$ . Thus, we estimate the unit price of insurance in regulated states when the commissioner is someone who desired higher elective office is approximately 8 percent higher than what we would expect from a competitive state with similar characteristics.<sup>16</sup> 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 automobile insurance although the effect is in the opposite direction. The sum of the estimated coefficient on the prior approval indicator plus the coefficient on the consumer advocate dummy variable is  $0.059 + -0.072 = -0.012$  which is not statistically different than zero. Thus, we find evidence consistent with anecdotal stories that consumer advocates take office and aggressively work to push down the price of insurance. Inconsistent with the industry's message, however, our results suggest consumer advocates do not appear to lower the average price below what would otherwise be the competitive market outcome.

Regarding the revolving door between government and the private sector, we do find evidence that prices are higher in prior approval states where the insurance commissioners migrate to the private sector following their tenure in office. However, the increase in average prices appears to be the result of something inherent to the rate setting process and not because of the private motivations of the regulator. In all models shown in Table 5, the estimated coefficient on the dummy variable indicating the regulator from a prior approval state went to the private sector after leaving office is very small and is never statistically different from zero. Thus, we do not find evidence consistent with the hypothesis that regulators who pass through the revolving door are overly lenient during the rate setting process. In fact, the result is consistent 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

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<sup>15</sup> See Appel (2002) for a similar argument to explain the profitability of the California automobile insurance market despite passage of Proposition 103 during the late 1980's.

<sup>16</sup> We calculated the estimated percentage increase in price by taking the estimated effect, 0.095, and dividing by the average premium ratio in regulated states over this time period, 1.189 (shown in Table 1).

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 an cost advantage relative to companies that rely upon independent agents to distribute their products.

The sign on the residual market variable is negative and significant in all models shown in Table 5. The result is consistent with the hypothesis that regulators in states with large residual markets are suppressing rates below competitive levels for at least some consumer groups which causes the insurance industry to withdraw coverage for these groups. 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.

The final conclusions that can be reached from our analysis 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 2.170 in Model 3 and 0.18 in Model 4. Neither test is statistically significant. Thus, unlike the conclusion reached in Cummins, Phillips and Tennyson (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 two of the three inverse Mills ratio terms are individually statistically significant and the F-statistic testing the hypothesis that all three terms are jointly equal to zero is rejected at the 1 percent confidence level. Thus, we have strong evidence the price of insurance and the future career choices of regulators are determined jointly. This result provides further evidence that the private incentives of the regulators impact the decisions they make while serving out their term in office. It also suggest that a potentially significant bias exists in the types of models that have generally been employed to examine the effects of regulation on state auto insurance markets.

## 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 studies, it may not be significant. In this paper we examine two sources of selectivity or endogeneity 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. In our paper we find evidence that prices are higher in prior approval states where the insurance commissioners migrate to the private sector following separation. However, we suggest the increase in prices is the result of something inherent to the rate setting process and not because of the private motivations of the regulator. In all of our models we find no evidence consistent with the hypothesis that regulators who pass through the revolving door are overly lenient during the rate setting process. 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 we find evidence that largest price effect is for commissioners who sought higher office after they left the insurance department. In fact we find the effect of a regulator seeking higher office in a prior approval state generates an 8 percent premium over a similarly situated competitive market state. 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.

Finally, we find evidence prior approval states have higher prices than competitive states. This is an interesting result given the fact that it is counter intuitive and that previous research had a difficult time in pinning down consistent results for this relationship. However, the result is consistent with the fact that during this time period prior approval states may not allow prices to be reduced when loss costs are reduced as quickly as competitive market states would allow. Recent evidence suggests, during a great majority of our study period, injury loss costs were falling. If one looks at rates over time, we see this to be true, but it is possible that the rates would have fallen even more in those states with prior approval regulation if the market was competitive.

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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)

| Code | Description of the Rating Law                                       |  |  |
|------|---|--|--|
| 1    | state-made rates  |  |  |
| 2    | prior approval without a deemer provision                           |  |  |
| 3    | prior approval with a deemer provision*                             |  |  |
| 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                |  |  |

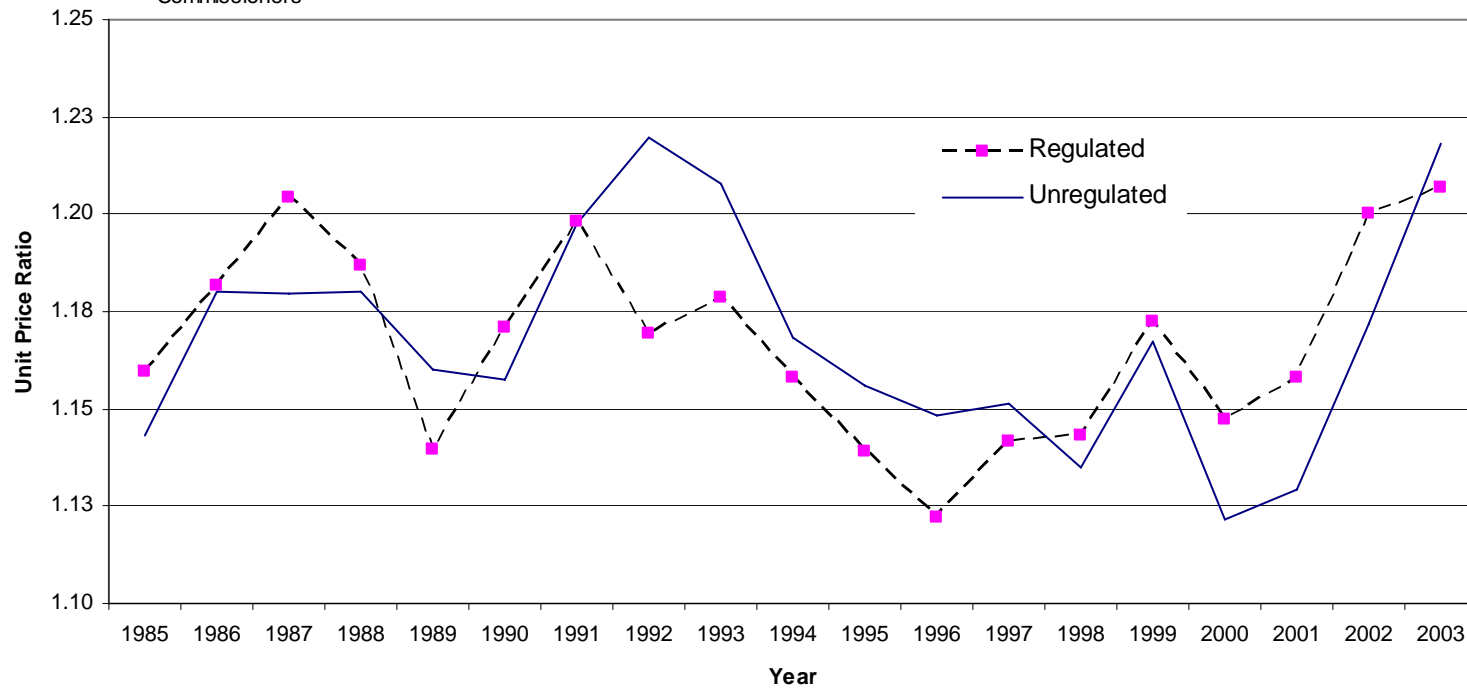
  

| State          | Rating Law 1          | Rating Law 2 | Rating Law 3 |
|----------------|-----------------------|--------------|--------------|
| Alabama        | 3:1972-2005           |              |              |
| Alaska         | 3:1972-2005           | 3:2005       |              |
| Arizona        | 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  |              |
| 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  |              |
| 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  |              |

\* - Rates 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.

**Figure 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



**Table 1**  
**Summary Statistics Regulated vs. Unregulated States: 1985 - 2002**

Table displays summary statistics of the political, economic, and 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.

| Variable   | Regulated States |           |           |             | Competitive States |           |           |             | T-test                        |
|--|------------------|-----------|-----------|-------------|--------------------|-----------|-----------|-------------|-------------------------------|
|  | Mean             | Std. Dev  | Min       | Max         | Mean               | Std. Dev. | Min       | Max         | $H_0: \mu_{Reg} = \mu_{Comp}$ |
| Unit Price Ratio                                       | 1.189            | 0.064     | 0.863     | 1.346       | 1.193              | 0.066     | 0.937     | 1.648       | 0.834                         |
| Ave. Loss Per Car Year (\$2004)                        | \$ 682.22        | \$ 181.85 | \$ 343.76 | \$ 1,352.31 | \$ 605.76          | \$ 147.79 | \$ 347.05 | \$ 1,073.36 | 6.649 ***                     |
| Ave. Prem Per Car Year (\$2004)                        | \$ 808.34        | \$ 207.92 | \$ 429.56 | \$ 1,575.53 | \$ 718.89          | \$ 164.59 | \$ 438.75 | \$ 1,243.13 | 6.881 ***                     |
| Percent Car Years in Residual Market                   | 5.79%            | 11.59%    | 0.00%     | 72.73%      | 0.81%              | 2.16%     | 0.00%     | 29.30%      | 8.887 ***                     |
| Total Written Car Years (000's)                        | 2,767            | 2,382     | 240       | 9,653       | 3,426              | 3,422     | 285       | 20,236      | 3.153 ***                     |
| Percent Liability Losses Incurred in No-fault Coverage | 7.28%            | 8.69%     | -4.66%    | 37.64%      | 8.07%              | 14.06%    | -0.41%    | 68.43%      | 0.947                         |
| Percent Losses Incurred in Liability Coverages         | 70.89%           | 7.42%     | 42.30%    | 87.64%      | 68.98%             | 5.86%     | 50.43%    | 82.27%      | 4.114 ***                     |
| Percent Premiums by Direct Writers                     | 62.11%           | 12.48%    | 20.66%    | 83.25%      | 64.05%             | 12.22%    | 26.98%    | 83.26%      | 2.253 **                      |
| Percent Private Sector Employees in Insurance Industr  | 1.81%            | 0.56%     | 0.67%     | 4.77%       | 1.86%              | 0.66%     | 0.89%     | 4.66%       | 1.184                         |
| Indicator = 1 if commissioner is elected               | 0.384            | 0.487     | 0.000     | 1.000       | 0.101              | 0.301     | 0.000     | 1.000       | 10.190 ***                    |
| Liberal Ideology Index                                 | 53.475           | 23.488    | 0.000     | 97.917      | 45.268             | 24.941    | 0.000     | 96.371      | 4.828 ***                     |
| Real Per Capita Income (\$2004)                        | \$ 28,187        | \$ 4,643  | \$ 17,410 | \$ 42,152   | \$ 27,961          | \$ 4,496  | \$ 19,818 | \$ 45,698   | 0.708                         |
| Population Density                                     | 226.05           | 291.29    | 0.96      | 1148.53     | 123.57             | 145.94    | 4.68      | 709.98      | 6.518 ***                     |
| Percent Miles Driven in Urban Areas                    | 54.14%           | 16.83%    | 24.44%    | 87.57%      | 50.06%             | 16.02%    | 21.43%    | 87.59%      | 3.555 ***                     |
| Poverty Rate   | 13.01%           | 4.44%     | 3.70%     | 27.20%      | 12.09%             | 3.12%     | 2.90%     | 22.90%      | 3.462 ***                     |

Note - there are 377 unregulated and 442 regulated state-year observations.

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

**Table 2**  
**Summary Statistics: Background and Careers of State Insurance**  
**Regulators over the Years 1985 - 2002**

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.

| Variable   | Regulated | Competitive | T -test<br>$H_0: \mu_{reg} = \mu_{comp}$ |
|--|-----------|-------------|--|
| <i>Characteristics and Background</i>                    |           |             |  |
| Indicator = 1 if commissioner is elected                 | 22.52%    | 6.36%       | 3.51 ***                                 |
| Tenure in Office   | 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 **                                  |
| Male   | 74.77%    | 78.18%      | 0.60                                     |
| <i>Career Prior to Tenure as Insurance Commissioner</i>  |           |             |  |
| Career Insurance Beauocrat                               | 18.92%    | 18.18%      | 0.14                                     |
| Career Beauocrat 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 Other Industries                          | 12.61%    | 6.36%       | 1.60 *                                   |
| Mixture Govt 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 ***                                 |

Note - 110 regulator observations from competitive states and 111 regulator observations from regulated states. \*\*\*, \*\*, \* denotes statistical significance at the 1, 5 and 10 percent levels, respectively.

**Table 3**  
**Employment Choice Following Tenure as Insurance Commissioner**

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.

| <b>Career Prior to Being<br/>Insurance Commissioner</b> | <b>Num</b> | <b>Insurance<br/>Department</b> | <b>Lateral<br/>Move in<br/>State Gov't</b> | <b>Seek<br/>Higher<br/>Office</b> | <b>Private<br/>Sector<br/>Insurance</b> | <b>Private<br/>Sector<br/>Other Than<br/>Insurance</b> | <b>Indicted or<br/>Resigned<br/>Amid<br/>Ethical<br/>Charges</b> | <b>Died</b> | <b>Retired</b> | <b>Still in<br/>office in<br/>2002</b> |
|---|------------|---------------------------------|--|-----------------------------------|---|--|--|-------------|----------------|--|
| 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 Other Industries                         | 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                                      |
| <b>Totals</b>   | <b>221</b> | <b>9</b>                        | <b>28</b>                                  | <b>16</b>                         | <b>105</b>                              | <b>28</b>  | <b>6</b>   | <b>1</b>    | <b>13</b>      | <b>15</b>                              |
| Percent of Total  |            | 4%                              | 13%  | 7%                                | 48%                                     | 13%  | 3%   | 0%          | 6%             | 7%                                     |

**Table 4**  
**Multinomial Regression Results of Post Employment Choice: 1985 - 2002**

Table displays the results of a multinomial logistic regression of the regulator's first employment choice following their tenure as insurance commissioner. Panel A displays the regression results of the multinomial logistic model  $\text{Prob}(\text{Employment Choice})/\text{Prob}(\text{Retired or Still in Office}) = f(\text{tenure, prior employment choice variables, performance of automobile insurance market variables})$ . 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 increases in the probability the commissioner chooses employment choice  $y$  for a 1 percent 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.

| <b>Panel A: Regression Results</b>  |  |   |                           |
|---|--|---|---------------------------|
| <b>Variable / Post Employment Choice</b>  | <b>Lateral<br/>Move into<br/>Gov't</b> | <b>Seek Higher<br/>Political<br/>Office</b> | <b>Private<br/>Sector</b> |
| Intercept   | -0.486<br>(1.529)                      | -1.107<br>(2.065)                           | 0.817<br>(1.196)          |
| Tenure in Office  | -0.167<br>(0.199)                      | -0.577 *<br>(0.320)                         | 0.097<br>(0.147)          |
| Tenure in Office x Indicator = 1 for Tenure >= 8 years                              | 0.026<br>(0.162)                       | 0.440 *<br>(0.237)                          | -0.114<br>(0.119)         |
| Ave. Loss Per Car in State to Ave. Loss Per Car in Nation                           | 1.597<br>(1.182)                       | 1.450<br>(1.648)                            | 0.255<br>(0.926)          |
| Ave. Premium Ratio Final Two Years in Office Minus National Premium Ratio           | 0.695<br>(5.306)                       | 3.156<br>(5.934)                            | -1.159<br>(4.331)         |
| Ave. Size of Residual Market Final Two Years Minus Size of Residual Market Nationwi | -6.539<br>(5.960)                      | -12.369<br>(13.525)                         | -0.133<br>(2.908)         |
| Graduate from Law School  | 0.271<br>(0.603)                       | 2.128 **<br>(0.863)                         | 1.117 **<br>(0.473)       |
| Career Beaucrocat   | -0.126<br>(0.686)                      | -2.441 *<br>(1.261)                         | -0.657<br>(0.605)         |
| Career Politician   | -0.686<br>(1.035)                      | 1.869 *<br>(1.110)                          | -0.968<br>(0.896)         |
| Prior Industry  | -3.000 **<br>(1.201)                   | -2.003<br>(1.279)                           | -0.603<br>(0.624)         |
| Log Likelihood Function Value   | -168.754                               |   |                           |
| Pseudo R-Squared  | 17.59%                                 |   |                           |

| <b>Panel B: Marginal Effects</b>  |  |   |                           |
|---|--|---|---------------------------|
| <b>Variable / Post Employment Choice</b>  | <b>Lateral<br/>Move into<br/>Gov't</b> | <b>Seek Higher<br/>Political<br/>Office</b> | <b>Private<br/>Sector</b> |
| Tenure in Office  | -0.024                                 | -0.016 *                                    | 0.045 *                   |
| Tenure in Office x Indicator = 1 for Tenure >= 8 years                              | 0.011                                  | 0.013 *                                     | -0.035 *                  |
| Ave. Loss Per Car in State to Ave. Loss Per Car in Nation                           | 0.145                                  | 0.028                                       | -0.103                    |
| Ave. Premium Ratio Final Two Years in Office Minus National Premium Ratio           | 0.161                                  | 0.100                                       | -0.367                    |
| Ave. Size of Residual Market Final Two Years Minus Size of Residual Market Nationwi | -0.650                                 | -0.297                                      | 0.738                     |
| Graduate from Law School Indicator  | -0.069                                 | 0.037                                       | 0.174 **                  |
| Career Beaucrocat Indicator   | 0.049                                  | -0.046 *                                    | -0.096                    |
| Career Politician Indicator   | -0.022                                 | 0.191                                       | -0.268 *                  |
| Prior Industry Indicator  | -0.184 ***                             | -0.025                                      | 0.069                     |

\*\*\*, \*\*, \* denotes statistical significance at the 1, 5 and 10 percent levels, respectively. Standard errors are reported in parantheses.

**Table 5**  
**Two-Stage Least Squares Premium Ratio Regression Results: 1985 - 2002**

Table displays unit price 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 model is estimated using two-stage least squares where we treat the percentage of written car years in the residual market as jointly determined with the unit price ratio. All models are estimated including state and year indicator variables to control for cross sectional and year specific fixed effects.

|   | No                    | No                    | Yes                   | Yes                   |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| Price Regulation Endogenously                             | No                    | No                    | No                    | Yes                   |
| Post Employment Choice of Regulator Endogenous            | No                    | No                    | No                    | Yes                   |
| <b>Variable</b>   | <b>Model 1</b>        | <b>Model 2</b>        | <b>Model 3</b>        | <b>Model 4</b>        |
| Intercept   | 1.732 ***<br>(0.404)  | 1.654 ***<br>(0.403)  | 1.634 ***<br>(0.398)  | 1.614 ***<br>(0.403)  |
| Percent Liability Losses Incurred in No-fault Coverage    | -0.616 ***<br>(0.072) | -0.641 ***<br>(0.075) | -0.631 ***<br>(0.074) | -0.664 ***<br>(0.076) |
| Percent Losses Incurred in Liability Coverages            | 0.782 ***<br>(0.057)  | 0.809 ***<br>(0.056)  | 0.812 ***<br>(0.055)  | 0.766 ***<br>(0.062)  |
| Percent Premiums by Direct Writers                        | -0.125 ***<br>(0.038) | -0.121 ***<br>(0.038) | -0.102 **<br>(0.042)  | -0.154 ***<br>(0.038) |
| Ave. Loss Per Car in State to Ave. Loss Per Car in Nation | -0.132 ***<br>(0.019) | -0.115 ***<br>(0.020) | -0.129 ***<br>(0.022) | -0.099 ***<br>(0.023) |
| Log(Written Car Years)                                    | -0.058 *<br>(0.030)   | -0.055 *<br>(0.030)   | -0.053 *<br>(0.030)   | -0.047<br>(0.030)     |
| Percent Car Years in Residual Market                      | -0.259 ***<br>(0.093) | -0.316 ***<br>(0.089) | -0.289 ***<br>(0.087) | -0.350 ***<br>(0.101) |
| Prior Approval Indicator                                  | 0.033 ***<br>(0.011)  | 0.056 ***<br>(0.015)  | 0.068 **<br>(0.030)   | 0.059 ***<br>(0.022)  |
| Prior Approval x Prior Career Beaucrocat                  |                       | -0.023 ***<br>(0.009) | -0.022 **<br>(0.009)  | -0.027 ***<br>(0.009) |
| Prior Approval x Prior Politico                           |                       | 0.013<br>(0.010)      | 0.014<br>(0.010)      | -0.002<br>(0.010)     |
| Prior Approval x Prior Industry                           |                       | -0.028 ***<br>(0.008) | -0.028 ***<br>(0.008) | -0.033 ***<br>(0.008) |
| Prior Approval x Probability Post Lateral Move to Govt    |                       | -0.033 ***<br>(0.009) | -0.033 ***<br>(0.009) | -0.018<br>(0.011)     |
| Prior Approval x Probability Post Higher Office           |                       | 0.032 ***<br>(0.011)  | 0.030 ***<br>(0.011)  | 0.036 **<br>(0.015)   |
| Prior Approval x Probability Post Private Sector          |                       | -0.006<br>(0.008)     | -0.007<br>(0.007)     | -0.004<br>(0.009)     |
| Prior Approval x Conumer Advocate                         |                       | -0.060 ***<br>(0.017) | -0.057 ***<br>(0.017) | -0.072 ***<br>(0.018) |
| Prior Approval x Elect                                    |                       | 0.039 *<br>(0.022)    | 0.015<br>(0.026)      | 0.031<br>(0.024)      |
| Regulated Inverse Mills Ratio                             |                       |                       | -0.034<br>(0.023)     | -0.005<br>(0.016)     |
| Unregulated Inverse Mills Ratio                           |                       |                       | 0.019<br>(0.017)      | 0.009<br>(0.015)      |
| Post Lateral Move to Govt Inverse Mills Ratio             |                       |                       |                       | -0.015 ***<br>(0.004) |
| Post Seek Higher Office Inverse Mills Ratio               |                       |                       |                       | -0.007 *<br>(0.004)   |
| Post Private Industry Inverse Mills Ratio                 |                       |                       |                       | -0.022 ***<br>(0.007) |
| R-squared   | 0.633                 | 0.651                 | 0.657                 | 0.662                 |

\*\*\*, \*\*, \* denotes statistical significance at the 1, 5 and 10 percent levels, respectively. Standard errors are reported in parantheses.

**Table 5 Continued**  
**Two-Stage Least Squares Premium Ratio Regression Results: 1985 - 2002**

Table displays unit price 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 model is estimated using two-stage least squares where we treat the percentage of written car years in the residual market as jointly determined with the unit price ratio. All models are estimated including state and year indicator variables to control for cross sectional and year specific fixed effects.

| Price Regulation Endogenously   | No             | Yes            | Yes            |
|---|----------------|----------------|----------------|
| Post Employment Choice of Regulator Endogenous  | No             | No             | Yes            |
| <b>Variable</b>   | <b>Model 2</b> | <b>Model 3</b> | <b>Model 4</b> |
| <b><i>F-Statistics for Selectivity Tests</i></b>  |                |                |                |
| $\beta_{\text{Regulated}} = \beta_{\text{Unregulated}} \text{ IMR} = 0$   |                | 2.170          | 0.180          |
| $\beta_{\text{Post Beaucrat}} \text{ IMR} = \beta_{\text{Post Higher Office}} \text{ IMR} = \beta_{\text{Post Private Industry}} \text{ IMR} = 0$ |                |                | 5.960 ***      |
| <b><i>Estimated Effect of Prior Approval Regulation by Regulator Type</i></b>   |                |                |                |
| $\beta_{\text{Prior Approval}} + \beta_{\text{Prior Approval} \times \text{Prior Career Beaucrat}} = 0$   | 0.033 **       | 0.046          | 0.032          |
| $\beta_{\text{Prior Approval}} + \beta_{\text{Prior Approval} \times \text{Prior Politic}} = 0$   | 0.069 ***      | 0.082 ***      | 0.057 **       |
| $\beta_{\text{Prior Approval}} + \beta_{\text{Prior Approval} \times \text{Prior Industry}} = 0$  | 0.028 **       | 0.040          | 0.026          |
| $\beta_{\text{Prior Approval}} + \beta_{\text{Prior Approval} \times \text{Post Lateral Move to Gov't}} = 0$                                      | 0.024          | 0.035          | 0.042 *        |
| $\beta_{\text{Prior Approval}} + \beta_{\text{Prior Approval} \times \text{Post Higher Office}} = 0$  | 0.089 ***      | 0.099 ***      | 0.095 ***      |
| $\beta_{\text{Prior Approval}} + \beta_{\text{Prior Approval} \times \text{Post Private Sector}} = 0$   | 0.050 ***      | 0.061 **       | 0.055 **       |
| $\beta_{\text{Prior Approval}} + \beta_{\text{Prior Approval} \times \text{Consumer Advocate}} = 0$   | -0.004         | 0.011          | -0.012         |
| $\beta_{\text{Prior Approval}} + \beta_{\text{Prior Approval} \times \text{Elected Commissioner}} = 0$  | 0.095 ***      | 0.083 ***      | 0.090 ***      |

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