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Cassandra Cole and Kathleen McCullough
Co-Editors

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The *Journal of Insurance Regulation* is sponsored by the National Association of Insurance Commissioners. The objectives of the NAIC in sponsoring the *Journal of Insurance Regulation* are:

1. To provide a forum for opinion and discussion on major insurance regulatory issues;
2. To provide wide distribution of rigorous, high-quality research regarding insurance regulatory issues;
3. To make state insurance departments more aware of insurance regulatory research efforts;
4. To increase the rigor, quality and quantity of the research efforts on insurance regulatory issues; and
5. To be an important force for the overall improvement of insurance regulation.

To meet these objectives, the NAIC will provide an open forum for the discussion of a broad spectrum of ideas. However, the ideas expressed in the *Journal* are not endorsed by the NAIC, the *Journal's* editorial staff, or the *Journal's* board.

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Contents

Cassandra R. Cole, Ph.D.
J. Bradley Karl, Ph.D.

The federal Affordable Care Act (ACA) imposed many new regulations on the health insurance marketplace, including a minimum medical loss ratio (MLR) requirement. However, several states had minimum MLR regulations in place prior to the enactment of the ACA. In this paper, we examine whether insurers operating in states with pre-ACA MLR regulations were better able to adapt to the new MLR requirements imposed by the ACA. We find evidence that state MLR requirements have adversely affected insurer market share. We also find that insurers operating in states without existing MLR requirements experienced decreases in market share relative to insurers operating in states with MLR requirements. Finally, there is evidence of a differential effect of the state and federal MLR requirements based on the extent of market share, with smaller insurers being more adversely affected.

Kevin Gatzlaff
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Previous finance literature has found that a firm's credit rating is influenced by the connectedness of its board members. Due to the subjective nature of credit ratings, qualitative information like a board's connections can influence a rating agency's decision making. We investigate the impact of four dimensions of board connectedness on credit ratings in the highly-regulated insurance industry. We find mixed evidence regarding the relationship between board connectedness and credit ratings in the insurance industry. As is the case for non-financial companies, we find some evidence that board connectedness is positively related to credit ratings for property/casualty (P/C) insurers, in line with social capital theory. However, for life insurers, we find that board connectedness is negatively associated with credit ratings, which supports the "board-busyness" theory. We suggest that the differing relationships between board connectedness and credit ratings among insurers are due to the short-term and riskier nature of property insurers, and that the disconnect between life insurers and non-financial companies is explained by life insurers' greater size, lower liquidity and higher leverage.

The Impact of Motor Vehicle Simulator Training on Law Enforcement Officer Driving Behavior: Empirical Evidence from Accident Frequency and Severity

Robert E. Hoyt

Local Government Risk Management Services (LGRMS) indicates that its No. 1 loss within law enforcement continues to be related to motor vehicle incidents. In order to reduce the risk of these incidents from occurring in the future, LGRMS provides simulator training for its members. As documented by our review of the literature, a question that has remained largely unanswered by prior studies is the efficacy of this sort of training in mitigating risk management costs. In this study, we use accident loss cost data over the period 2000–2015 to determine whether motor vehicle simulator training is reducing loss frequency and severity, and whether such training is cost effective. Our analysis suggests that the training not only reduces accident frequency, and to some extent loss severity, but its return on investment (ROI) is 12:1. Given the recent concern over increasing motor vehicle loss frequency and severity in most states, our research has important implications for state legislative and regulatory authorities as they seek ways to mitigate growing motor vehicle loss costs. In addition to the benefits that we document for the use of motor vehicle simulator training of law enforcement officers (LEOs), our results suggest that efforts by state insurance regulators and legislators to facilitate and encourage motor vehicle simulator use as part of their state's licensing and insurance requirements would provide important benefits to the public in their state.

This paper examines the steps taken by life insurers writing participating business in the UK to protect their solvency during the global financial crisis of 2008. It highlights two areas where the insurers had discretion and the interest that regulators have in controlling that discretion. The first is that the regulations then in force allowed discretion to insurers in the discount rate they used to calculate their liabilities in the calculations of solvency that were required. This paper finds that one of the main responses of the insurers to the global financial crisis was to reduce the margin of prudence in the discount rate they used to value their liabilities, meaning that their liabilities were given a lower value than otherwise, with a consequent increase in their reported solvency. Insurers also used their discretion to increase their charges to and reduce the payouts to policyholders, while they also reduced risks by adopting a more conservative investment strategy. This paper then considers the effect of Solvency II regulation introduced in the European Union (EU) in 2016 and the implications for regulators generally. Regulators need to be wary of rules that offer insurers discretion in calculating their liabilities; they may use it to enhance their reported financial position in a way that is essentially artificial. Solvency II removes the discretion in choice of discount rate, implying that insurers need to review how they manage solvency in adverse circumstances. It is also suggested that European regulators review their rules to ensure that policyholders are fairly protected when insurers have discretion on charges and payouts.

This paper discusses and analyzes the problems for life insurers when individuals obtain results from genetic tests that can have bearing on their estimated mortality. Some forms of genetic information are valuable in the underwriting process, especially test results that may be relied on by medical doctors for treatment. To the extent that test results lead to better medical care, underwriting consequences may be favorable. If the information is not allowed for underwriting, insurers will experience some degree of adverse selection, which will raise the cost of coverage for all applicants and reduce the availability of coverage. This paper considers one recent proposal in the state of Florida to extend a ban on the use of genetic test results in health insurance underwriting to life insurance, disability and long-term care (LTC). This paper concludes that the financial consequence of a ban on the use of genetic information in life insurance underwriting could significantly increase the risk of insolvency; legislation that imposes restrictions on the use of genetic information may be a reasonable compromise to a complete ban.

Editors' Perspective

The goal of the *Journal of Insurance Regulation* (JIR) continues to be to provide solid, unbiased research to help those tasked with making public policy decisions in insurance. This year, articles covered a wide array of topics, including medical loss ratios (MLRs); genetic testing and its impact on life insurance; prescription drug insurance plans; the use of new technology, such as motor vehicle simulators; affordability of automobile insurance; as well as several papers related to solvency regulation. Other articles provided a primer on social media liability, and one paper discussed the future challenges facing the industry. We appreciate the care the authors provided in creating these studies.

This year, we are pleased to announce a closer working relationship with the Center for Insurance Policy and Research (CIPR). The CIPR is committed to promoting JIR articles on both their website, as well as at NAIC events. Additionally, the CIPR sponsored a session at the 2019 NAIC Fall National Meeting in Austin, TX, to highlight the work of the JIR, as well as to acknowledge the 2018 Kimball Award winner, Thomas Müller, for his paper, "Analyzing the Impact of Time Horizon, Volatility and Profit Margins on Solvency Capital: Proposing a New Model for the Global Regulation of the Insurance Industry."[1] After Müller's presentation, the co-editors had the opportunity to talk about the type of research the JIR is seeking, as well as share some insight into the review process for potential authors.

This year, we hope to accomplish several goals. First, we hope to ensure that published papers are beneficial to all stakeholders; we are working to more closely link articles with key research initiatives of the CIPR. This year, the main initiatives include:

- Annuity Suitability & Best Interest Standards
- Climate/Natural Catastrophe Risks and Resiliency
- Data, Innovation and Cyber
- Group Capital Calculation (GCC)
- Health Insurance
- Insurance Capital Standard (ICS)
- Long-Term Care Insurance (LTCI)
- Macroprudential Initiative (MPI)

Authors interested in these topics can find additional information on the CIPR website at *https://content.naic.org/cipr_key_issues.htm.* While we will publish articles on other subjects closely related to insurance regulation in the U.S., we hope authors will consider topics in line with the key research initiatives this year.

Further, the JIR is developing opportunities for potential authors to interact with others researching in the same area, as well as obtain feedback on research from academics, practitioners, and state insurance regulators. In January 2020, we issued a call for proposals on Climate/Natural Catastrophe Risks and Resiliency. Authors of selected papers will have the opportunity to present their research at the 2020 NAIC Fall National Meeting in Indianapolis, IN, Nov. 14–17, 2020.

1. The Kimball Award, which includes a cash award of $2,000, recognizes one outstanding JIR article each year based on its contribution to the literature and relevance for state insurance regulators. To see past winners and find out more about the award, visit *https://www.naic.org/prod_serv_kimball_award.htm.*

Proposals are due May 29, 2020, and draft papers on Oct. 16, 2020. More information can be found at *https://www.naic.org/documents/prod_serv_proposals_call.pdf?95*.

Finally, this year, we are developing opportunities for potential authors to share their research with a wider audience. Authors will have the opportunity to create one-page summaries to be promoted and distributed by both the JIR and the CIPR. These summaries will be written in an accessible manner that will help policy makers quickly gain a basic understanding of the research and then use the full paper for further details. The goal of the project is to provide a wider impact of the authors' research.

We look forward to these new initiatives and the increased partnership with the CIPR. We feel that his will benefit both the authors of the JIR as well as the state insurance regulator community that the *JIR* supports.

The Differential Effects of Medical Loss Ratio Regulation on the Individual Health Insurance Market

Cassandra R. Cole, Ph.D.*
J. Bradley Karl, Ph.D.**

Abstract

The federal Affordable Care Act (ACA) imposed many new regulations on the health insurance marketplace, including a minimum medical loss ratio (MLR) requirement. However, several states had minimum MLR regulations in place prior to the enactment of the ACA. In this paper, we examine whether insurers operating in states with pre-ACA MLR regulations were better able to adapt to the new MLR requirements imposed by the ACA. We find evidence that state MLR requirements have adversely affected insurer market share. We also find that insurers operating in states without existing MLR requirements experienced decreases in market share relative to insurers operating in states with MLR requirements. Finally, there is evidence of a differential effect of the state and federal MLR requirements based on the extent of market share, with smaller insurers being more adversely affected.

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Introduction

Providing affordable health insurance coverage to all citizens is a challenge faced by many countries. In the U.S., the passage of the ACA was designed to increase the availability and affordability of health insurance to Americans. The ACA contains 10 legislative titles and spans nearly 1,000 pages. While it is lengthy and contains a number of provisions, one provision that became effective soon after the passage of the ACA is the MLR requirement. The law currently requires that health insurers either spend at least 80% of premiums collected for individual and small group health insurance on medical claims and quality improvement or rebate the difference to its policyholders. For large group plans, the MLR requirement is 85%. Insurers must report MLRs to the Department of Health and Human Services. This provision, designed to encourage insurers to increase spending on quality improvements, reduce administrative costs, and/or help keep premiums down via rebating, became effective Jan. 1, 2011.[1, 2]

A study by Hall and McCue in early 2012 estimated the effect the MLR requirement would have had on insurers if it had been in effect one year earlier. The authors found that close to $2 billion in rebates would have been due in 2010, with 5.3 million consumers in the individual market receiving close to $1 billion. The first year in which the MLR requirement was in effect, enrollees received a little over $1 billion, significantly less than the estimate based on 2010 premiums and costs.[3] The next two years, rebates dropped with slightly more than $500 million in rebates due to approximately 8.5 million enrollees in 2012 and approximately 332 million owed to about 6.8 million enrollees in 2013. However, in 2014, insurers owed close to $470 million in rebates to enrollees.[4] Though the number of total rebates issued has declined since the initial high level in 2011, a substantial amount of premium dollars are still rebated annually.[5, 6]

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1. The MLR requirement applies to all but self-insured plans. However, it did not apply to nonprofit insurers until 2014.

2. 17 states applied for an adjustment to the MLR requirement. Of these, seven states received approval to utilize a lower MLR requirement for some period of time. These states are Georgia, Iowa, Kentucky, Maine, Nevada, New Hampshire and North Carolina.

3. This may be the result of insurers making internal adjustments in response to the law, as suggested by prior research. A study by Turnbull and Kane (1999) suggests that insurers may alter accounting and actuarial practices in response to the regulation of MLRs. If this type of manipulation occurs, it could potentially negate some of the benefits of regulating MLRs. Harrington (2013) finds that MLR regulation could have several adverse consequences, including higher costs and barriers to entry, and this ultimately lead to increased market concentration.

4. This information was obtained from the federal Centers for Medicare & Medicaid Services (CMS) website. See *https://www.cms.gov/CCIIO/Resources/Data-Resources/mlr.html* for more detailed information, including a breakdown of rebates by state and by insurer during this period.

5. Information obtained from reports provided by the CMS is available on their website at *https://www.cms.gov/CCIIO/Resources/Data-Resources/mlr.html*.

6. Without constraints, this provision might lead insurers to alter underwriting standards in an effort to change the 'quality' of the business insured. However, two other provisions of the ACA restrict insurers' abilities to do so. First, companies selling individual health insurance can no

Prior to the passage of the ACA, some states already regulated MLRs. Existing state MLR requirements applied to the individual market; the group market; or, in some states, both. State MLR requirements ranged from a low of 50% to a high of 85%. In some cases, they were conditional on whether it was a newly issued policy or a renewal, the specific type of policy, and/or the cost of coverage (America's Health Insurance Plans, 2010).[7]

Though the ACA has been in effect for several years, some recent government actions may result in some changes to the existing system.[8] Most relevant to the current study is a recent Notice Rule by the Centers for Medicare & Medicaid Services (CMS). The Rule indicates that a state will be allowed to change the MLR requirements for insurers beginning in 2019 if it can demonstrate that this change will benefit the insurance market. The Rule, issued on April 9, 2018, specifically "allows states to request reasonable adjustments to the MLR standard for the individual market if the state shows a lower MLR standard could help stabilize its individual insurance market."[9] States that reduce the MLR requirement may be more attractive to insurers than states with higher requirements, providing consumers in these states with more options and possibly better prices.

In the current study, we consider the potential effect of the MLR requirement on the extent to which health insurers operate in the individual health insurance markets post-ACA. To the extent that health insurers are able to adapt by making internal adjustments as suggested by prior literature (Turnbull and Kane, 1999), such as modifications to accounting and actuarial practices, the provision may not affect the business of health insurers, and it could serve to increase the number of insurers operating in the marketplace. Alternatively, to the extent that the MLR requirement leads to increased regulatory costs and decreased profit margins, insurers may reduce business activity in particular markets or exit some markets

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longer deny applicants with preexisting conditions. Second, rating factors for most individual and group plans are now limited to age, tobacco use, family size and geographic location. It should be noted that some of the ACA provisions do not apply to grandfathered and grandmothered plans. For specific details on the final rules as they relate to rating factors, see *https://www.cms.gov/CCIIO/Resources/Files/Downloads/market-rules-technical-summary-2-27-2013.pdf*.

7. See America's Health Insurance Plans (April, 2010) available online at *www.naic.org/documents/committees_e_hrsi_comdoc_ahip_chart_mlr.pdf* for information on states with conditional MLR requirements.

8. Though not related to the MLR, a 2017 executive order could significantly affect health insurance exchanges. This order reduced funds previously allocated for advertising, reduced the time period in which individuals had to elect coverage on exchanges, and immediately stopped reimbursements to insurers for providing lower deductibles and out-of-pocket costs to low income individuals. In addition, a provision in the Tax Cuts and Jobs Act of 2017 (TCJA) removed the penalty for individuals that do not maintain health insurance coverage. Collectively, these changes may reduce the demand for coverage by consumers and/or the willingness of insurers to operate on exchanges, which could lead to reduced options for consumers buying coverage on exchanges and possibly higher cost individual health insurance coverage.

9. Additionally, the Rule increases the maximum allowable rate increase with rate review from 10% to 15% and provides states with options in terms of determining essential health insurance benefits. See *https://www.cms.gov/Newsroom/MediaReleaseDatabase/Press-releases/2018-Press-releases-items/2018-04-09.html* to review the full notice.

completely.[10] We also consider whether the effect of the MLR requirement imposed by the ACA varies for insurers operating in states with existing MLR requirements compared to those operating in states without such requirements. Understanding the effect of the ACA's MLR requirement on insurers and the health insurance marketplace overall has become increasingly important in light of the recent Rule allowing states to change MLR requirements beginning in 2019. This is an important issue to consider as how health insurers respond to MLR requirements could adversely affect consumers by increasing the cost of coverage and/or reducing consumer choices.

Literature Review

There is a large body of literature on the effect of legislation on health insurance markets in the U.S. with a growing number of studies focusing on the ACA in particular.[11] However, few studies focus specifically on the MLR requirement. In this section, we review some of the most relevant health insurance reform literature.

A number of countries have passed legislation for the purpose of improving the availability and affordability of health insurance coverage. This has led to research regarding the effectiveness of these strategies. Early studies involving the Health Insurance Act of 2006, a Dutch health reform measure, found that both health insurance losses and premiums increased in the two years following the implementation of the health insurance reform measures (Rosenau and Lako, 2008). Later studies find that, while the Health Insurance Act has been effective in reducing the percentage of the population that is uninsured, health care costs have continued to rise (Ginneken, Swartz, and Van der Wees, 2013; Maarse, Jeurissen, and Ruwaard, 2016). However, the growth rate of health care expenditures has slowed (Maarse, Jeurissen, and Ruwaard, 2016). In addition, while 'risk selection' is not allowed, there is a wide variation in premiums which suggests that there is still some selection taking place (Maarse, Jeurissen, and Ruwaard, 2016).

10. Karaca-Mandic, Abraham, and Simon (2015) find the fact that insurers with more market power have lower MLRs suggests that insurers may respond to the MLR regulations with any number of strategic operational decisions.

11. There is a significant amount of literature on the effect of the regulation of health insurance in other countries. For example, in Australia, three major initiatives were implemented within a three-year period which led to an increase in the number of insured persons. One study considers the issue of whether the penalties imposed for purchasing the coverage later in life, when expected health insurance costs are higher, appropriately addresses the age-based adverse selection. Using a modified Rothschild-Stiglitz model, the study draws several major conclusions from its findings in that older, low risk individuals will not be incentivized to purchase insurance and that it is not likely that the provision will lead to full insurance coverage (Brown and Connelly, 2005). A later study uses regression-discontinuity in an attempt to isolate the effect of the requirement to purchase coverage provision on the size of the uninsured population. The authors find that 22–32% of the increase in the number of insureds resulted from the requirement to purchase hospital coverage (Palangkaraya and Yong, 2007).

As it relates to the most recent health insurance reform, a number of reports and academic studies focus on the potential effect of the ACA, or specific provisions thereof, on a variety of factors including the uninsured population and the health insurance market. The findings, as they relate to the MLR requirement, are mixed. McCue, Hall, and Liu (2013) examine the MLRs, administrative cost ratios, and operating margins for health insurers operating in the individual market, and they find some positive effects. Specifically, for-profit insurers experienced increased MLRs as well as decreased administrative cost ratios and operating margins from 2010 to 2011. For the group insurance market, the authors find lower administrative cost ratios for both small group and large group markets, but only lower operating margins are found for the large group market. Both in the individual and group markets, there appear to be differences between nonprofit and for-profit insurers. McCue and Hall (2015) find similar results between 2011 and 2012 for the individual market. The study also finds that MLRs increased and administrative cost ratios decreased for both the small group and large group markets. Additionally, profit margin increased for the small group, while there were no significant differences in profit margin for the larger market. However, the study only finds these results for for-profit insurers.

Alternatively, Day, Himmelstein, Broder, and Woolhandler (2015) find that the MLR requirement created by the ACA has very little effect on insurer overhead spending, given the components of the formula used in calculating the MLR. These components include quality improvements and certain other costs as part of medical payments (the numerator); and they exclude some taxes, regulatory fees, and other spending from income (the denominator). The authors reach this conclusion after examining the MLRs of health insurers before and after the implementation of the MLR requirement, and they find no significant changes.

The differences in the findings of studies examining the effect of the MLR requirement may be due to the samples utilized. Day, Himmelstein, Broder, and Woolhandler (2015) use only health insurers listed on the Fortune 500. This results in a sample size of only nine health insurers, all of which are large firms. Alternatively, the other studies start with data obtained from the NAIC. This results in a larger sample size and includes nearly all insurers operating in the health insurance marketplace.[12]

Though there have been some studies which focus on the effect of the MLR requirement on insurers, as discussed above, the results have been mixed, and prior research utilizes univariate analysis only. As such, they do not control for other factors that may affect changes in the financial performance of health insurers. In addition, as noted in Harrington (2013), there may be some unintended consequences of the MLR requirement including barriers to entry for new insurers and increased market concentration as insurers work to meet the MLR requirement or possibly achieve economies of scale. In the current study, we utilize difference-

12. The authors apply some screens to the initial data set for conducting their analysis, so the study does not include every insurer operating in the health insurance marketplace. However, the screens applied are commonly utilized in insurance studies.

in-difference methodology to determine the effect of the MLR requirement on insurers, controlling for other factors that could affect insurer market share. In addition, we are able to determine if the effect of the ACA's MLR requirement varies in the presence of existing state MLR requirements. This is a substantial addition to existing literature on this particular provision of the ACA.

Data and Methodology

To examine the effect of the implementation of the MLR requirement on the health insurance marketplace, we use the NAIC database. We obtain firm-state level premium information on health insurers by line, as well as firm level financial and organizational data for the period 2001–2014. To ensure that the sample includes active health insurers, we exclude all insurers with nonpositive values for direct premiums earned, losses, assets, and surplus. In this analysis, we focus on insurers operating in the individual market. As such, we also exclude any insurer with nonpositive direct premiums earned for individual health insurance. The final panel dataset consists of 4,573 firm-state-year observations.

In addition to the firm level health insurer information, we identify states with existing individual MLR requirements prior to the passage of the ACA. These states were identified using information obtained from multiple sources. More than half of the states had individual MLR requirements in place prior to 2010.[13]

The passage of the ACA in 2010 allows us to conduct a natural experiment. Utilizing difference-in-difference estimation, we examine the effect of the new legislation (pre- and post-ACA) on insurers operating in states with and without existing MLR requirements (treatment and non-treatment groups).[14] Though some prior research suggests the MLR requirement has had some positive effects, Harrington (2013) suggests there could be several unintended consequences,

13. Specifically, we use "State Mandatory Medical Loss Ratio (MLR) Requirements for Comprehensive, Major Medical Coverage: Summary of State Laws and Regulations" published in April 2010 by America's Health Insurance Plans to identify states with existing MLR requirements. This information is verified by a search of the state statutes to confirm the existence of the requirement, verify the implementation date of the requirement, and ensure that no substantial changes to the requirement were made during the sample period. The following states identified as having an individual MLR in place during the sample period: Arizona; California; Colorado; Delaware; Florida; Iowa; Kansas; Kentucky; Maine; Maryland; Massachusetts; Michigan; Minnesota; New Jersey; New York; North Carolina; North Dakota; Pennsylvania; South Carolina; South Dakota; Tennessee; Utah; Vermont; Virginia; Washington and West Virginia. Note that California is not included in our analysis due to a lack of available information.

14. Because of the inclusion of the *NoStateMLR* and *Post-ACA* indicators, it is not possible to also include year-fixed effects and state-fixed effects due to collinearity. An alternate version of the model presented in Table 4 is constructed in which these two variables are excluded while year- and state-fixed effects are added. In these models, the interaction variable remains significant and negative which is consistent with the results of the models reported in Table 4. The results on the firm-specific factors are also consistent.

including barriers to entry and increased market concentration. As such, we focus on the effect of the MLR requirement on market share.

For firm *i*, in state *s* during year *t*, we estimate several fixed effect regression models that take the general form of:

$$Y_{ist} = \alpha_{ist} + NoStateMLR_{ist} + Post-ACA_t + NoPriorMLR * Post-ACA_{ist} + \varepsilon_{ist} \quad 1) \quad + Y_{ist} + Z$$

Here, Y is the natural logarithm of market share using either premiums earned or member months. The market share of a given firm is calculated as the premiums earned (member months) for firm *i* in state *s* during year *t*, scaled by total premiums earned (member months) of all insurers operating in state *s* during year *t*.

There are three primary variables of interest. First, *NoStateMLR* is a dummy variable indicating that a given state did not have an MLR requirement in place prior to the ACA. Second, *Post-ACA* is a dummy variable equal to one in the years in which the ACA imposed the MLR requirement (2011–2014). Third is the interaction of the state and ACA indicator variables, called *NoStateMLR*Post-ACA*. To control for the effect of firm-specific factors on market share, we also include a vector of firm characteristics, Y. Finally, Z represents firm indicator variables, and ε is the stochastic error term. Robust standard errors are reported for all models.

The firm-specific characteristics included in the model are: size; capitalization; mutual indicator; group indicator; percent of business in the group market; monostate indicator; age; and nonprofit indicator.[15] Similar to prior studies that consider the effect of regulation on the structure and performance of the insurance marketplace (Weiss and Choi, 2008), we control for size and financial viability. In our model, size is measured as the natural logarithm of assets, while capitalization is measured as surplus divided by assets. We would expect that larger and more capitalized insurers will have a larger market share relative to smaller and less capitalized insurers. Insurance studies also consistently demonstrate the effect of organization form on business decisions (Mayers and Smith, 1988; Lamm-Tennant and Starks, 1993; Karl and Nyce, 2014). As such, we include a mutual indicator, which is equal to one if the insurer is a mutual company and zero otherwise. We have no *a priori* hypothesis related to this variable.

Recognizing the need to control for group affiliation (Weiss and Choi, 2008), we include a group indicator, which is one if the firm is a member of a group and zero otherwise. If the firm is a member of a group, it is possible that the insurer can benefit from the knowledge and expertise of other members of the group. If this is

15. Some insurance studies also include controls for being publicly traded and distribution type. However, we do not include these variables in the current study due to a lack of variation. Specifically, nearly 96% of the sample are not publicly traded and 85% have the same distribution type. As a robustness test, we run a variation of the model, including these controls for the years 2003–2013. These two variables are not significant, and the results for the other variables included in the model are generally consistent with those reported here. Results are available from the author upon request.

beneficial in managing MLR requirements, we would expect a positive effect on market share.

Since prior research highlights the differences among different health lines of business (Cole, He, and Karl, 2015), we include a variable to control for the percent of business in the group market (measured as premiums earned in group insurance divided by total premiums earned). Since total group direct premiums written are consistently greater than premiums written in the individual market on an annual basis[16], insurers with a greater percentage of business written in the group market may have larger market shares. If this is the case, we expect the group market variable to be positive and significant.

We also include a monostate indicator, which is equal to one if the insurer operates in only one state and zero otherwise. Insurers focused on single states are likely to have larger market shares relative to insurers operating in multiple states. Age is calculated as the national logarithm of years in business. Relative to younger insurers, older and more established insurers may exhibit differences in efficiencies, underwriting expertise, or similar operating characteristics which may have consequences for insurer market share. Finally, the nonprofit indicator, equal to one if the insurer is a nonprofit and zero otherwise, is included as prior research suggests that differences exist between these two groups of insurers.

Results

Summary Information

Before we examine changes in market share, we first consider the trends in the average number of insurers operating in each state. Table 1 reports these trends separately for states with and without existing MLR requirements. As shown in Panel A, there has been a growth in the average number of health insurers operating in both states with and without MLR requirements as well as both pre- and post-ACA. However, the growth is greater in states with no state MLR requirement in comparison to states with MLR requirements. In addition, both pre- and post-ACA, there were more insurers operating in states with MLR requirements compared to those without, expect in the most recent year of the sample.

16. In 2017, insurers wrote approximately $162 billion in direct premiums in group comprehensive coverage and less than $70 billion in individual comprehensive coverage. While the individual market has seen greater premium growth than the group market, the group market is still substantially larger. See Table 3 of the NAIC/Center for Insurance Policy and Research 2017 Health Insurance Industry Analysis Report for additional details (available online at *https://www.naic.org/documents/topic_insurance_industry_snapshots_2017_health_ins_ind_report.pdf?48*).

Table 1:
Average Number of Insurers Operating in Health Insurance Market
Panel A: Average Number of Insurers in States by Year

	Year	State MLR	No State MLR	Diff.
Pre-ACA	2001	10.2333	5.9565	4.2768
	2002	10.2381	6.1515	4.0866
	2003	11.0149	7.0370	3.9779
	2004	10.3835	7.2564	3.1270
	2005	9.8489	7.1221	2.7268
	2006	9.6939	8.4545	1.2393
	2007	10.2364	8.8810	1.3554
	2008	10.4320	8.8652	1.5668
	2009	10.5843	9.6211	0.9632
	2010	10.1429	10.3900	-0.2471
Post-ACA	2011	11.1778	10.2362	0.9416
	2012	11.7849	10.1168	1.6682
	2013	12.7835	11.0571	1.7264
	2014	13.6991	13.3566	0.3425

Panel B: Average Number of Insurers in States

	Pre-ACA	Post-ACA	Diff.	% Change	Sig.
State MLR	10.2826	12.4427	2.1601	21%	***
No State MLR	8.3347	11.3403	3.0056	27%	***
Difference	1.9479	1.1025			
% Change	23%	10%			
Sig.	***	***			

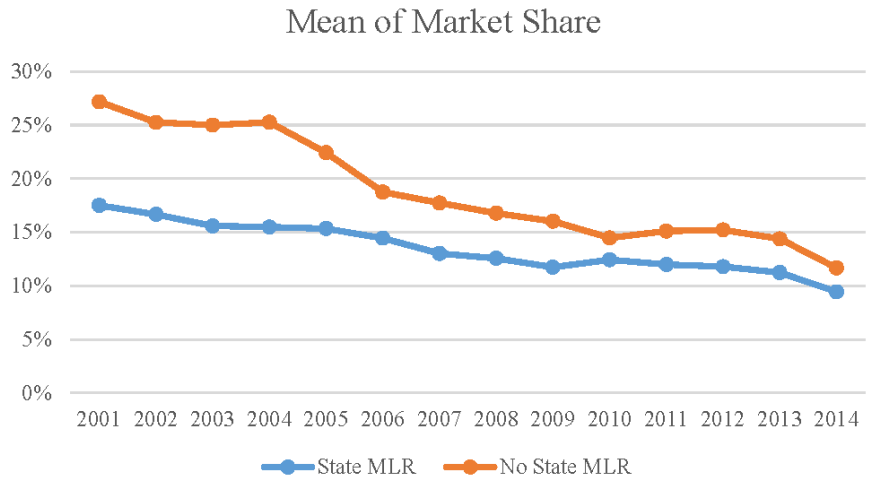
Source: Authors' analysis of health insurer data from the NAIC for the years 2001–2014.

Panel B of the table shows the average number of insurers operating in each state during the sample period. The growth in the average number of insurers operating in states with MLR requirements post-ACA is 21%, which is approximately 6% less than the growth observed in states without MLR requirements. In addition, the difference in the average number of insurers in states with and without MLR requirements is smaller post-ACA. T-tests of the means indicates that these differences are all statistically significant at the 1% level. This

summary evidence suggests that there was increased competition in the health insurance marketplace post-ACA. Post-ACA, there also appears to be less of a difference in the extent of competition in states with MLR requirements compared to those without MLR requirements.

Figure 1 shows the average market share of insurers operating in the individual market during the sample period. We separately examine insurers operating in states with and without an existing MLR requirement. It is apparent that average market share has declined during the sample period. It is also evident that average market share is consistently larger for insurers operating in states with no existing MLR requirements. This finding is consistent with those reported in Table 1, which indicate that there are fewer insurers operating in states with no MLR requirements in comparison to those with MLR requirements.[17]

Figure 1:
Average Market Share



In terms of pre-ACA, as shown in Table 2, the average market share of insurers operating in states with a state MLR requirement is approximately 14% while the average market share of insurers operating in states without a state MLR requirement is nearly 19%. This difference persists post-ACA; however, the magnitude of the difference is smaller. With the exception of states with and without an MLR requirement post-ACA, these differences are all significant at the 1% level.

17. To determine if the decline in average market share reported in Figure 1 is significant, we construct a basic model which includes the firm-specific variables used in the later models and year-state indicators. The omitted year is 2001. We find that every year variable is significant and negative. Tests of the year coefficients suggest that the decline in market share is generally significant during these time periods: 2002–2003; 2004–2005; 2008–2009 and 2013–2014. Results are available from the authors upon request.

Based on these findings, we would expect the *NoStateMLR* variable to be significant and positive and the *Post-ACA* variable to be insignificant. As a result, the expectation of the combined effect, *NoStateMLR*Post-ACA*, is unknown.

Table 2:
Average Market Share Differences

	Year	State MLR	No State MLR	Diff.
Pre-ACA	2001	17.50%	27.17%	-9.67%
	2002	16.67%	25.25%	-8.59%
	2003	15.67%	23.15%	-7.48%
	2004	15.79%	23.08%	-7.29%
	2005	15.83%	20.61%	-4.78%
	2006	14.97%	17.53%	-2.57%
	2007	13.33%	16.67%	-3.33%
	2008	13.02%	15.73%	-2.71%
	2009	12.36%	14.74%	-2.38%
	2010	12.57%	14.00%	-1.43%
Post-ACA	2011	12.22%	14.07%	-1.85%
	2012	11.83%	14.21%	-2.39%
	2013	11.34%	13.33%	-1.99%
	2014	9.73%	10.85%	-1.12%

Source: Authors' analysis of health insurer data from the NAIC for the years 2001–2014. Notes: Averages are calculated separately for insurers operating in states with an MLR requirement and states without pre-ACA and post-ACA.

Regression Model Results

Summary statistics for variables used in the models are provided in Table 3 (on page 12).[18] The main regression model results are presented in Table 4 (on page 13). The results, presented in the first column, measure market share using premiums earned. In the second column, market share is measured using member months. The results are consistent across both model specifications.

18. There are two observations in which the percent of group insurance written exceeds one. To ensure that these observations are not affecting the results, the models are run excluding these observations. The results remain consistent with those reported in Table 4.

Table 3:
Summary Statistics

Variable	Mean	Std. Dev.	Min	Max
Dependent Variables				
ln(Market Share - Premiums Earned)	-4.3981	2.9552	-15.1668	0.0000
ln(Market Share - Member Months)	-4.5469	3.1371	-15.6633	0.0000
Independent Variables				
No State MLR	0.5032	0.5000	0.0000	1.0000
Post-ACA	0.3610	0.4803	0.0000	1.0000
No State MLR*Post-ACA	0.1890	0.3916	0.0000	1.0000
Size	12.3575	1.9308	6.2231	16.6964
Capitalization	-0.7265	0.3564	-7.1731	-0.0009
Percent Group Insurance	0.5621	0.3415	0.0000	1.0000
Mutual	0.1225	0.3279	0.0000	1.0000
Group	0.8591	0.3479	0.0000	1.0000
Age	3.1971	0.8352	0.0000	4.6821
Non-Profit Indicator	0.2485	0.4322	0.0000	1.0000
Total States	4.4712	8.8602	1.0000	36.0000

Source: Authors' analysis of health insurer data from the NAIC, America's Health Insurance Plans (AHIP), and state statutes for the years 2001–2014.

As expected, the *NoStateMLR* variable is significant and positive. This result indicates that the market share of the average insurer is lower in states with MLR requirements, suggesting that the existence of state MLR requirements have adversely affected insurers operating in these states as it relates to market share. Also as expected, the *Post-ACA* variable is not statistically significant. However, the interaction of *NoStateMLR* and *Post-ACA* is significant and negative. This result suggests that post-ACA, market shares declined for insurers operating in states with no MLR requirement. In other words, insurers operating in states with no existing state MLR were adversely affected by the MLR requirement imposed by the ACA.

In addition to the variables of interest, several of the control variables are significant. Specifically, we find that larger insurers and insurers that only operate in a single state have larger market shares, suggesting that large specialized insurers have found success in the individual marketplace. In addition, the results suggest that insurers that more capitalized, established insurers, and nonprofit insurers tend to have lower market shares.[19]

19. Both age and the mutual indicator are significantly correlated with size at a level above .5. As such, the age and mutual variables are removed from the models. In the reduced model, the results on the remaining variables are unchanged.

Table 4:
Model Results

	Premiums Earned	Member Months
NoStateMLR	0.8900***	0.8558***
	[0.104]	[0.107]
Post-ACA	-0.0705	-0.0578
	[0.090]	[0.093]
NoStateMLR*Post-ACA	-0.3961***	-0.3634***
	[0.111]	[0.114]
Size	0.7197***	0.8191***
	[0.079]	[0.081]
Capitalization	-0.6743***	-0.7584***
	[0.107]	[0.110]
Mutual	-0.4942	-0.6181
	[0.517]	[0.532]
Group	0.1766	0.2087
	[0.187]	[0.193]
Percent Group Insurance	-0.0252	0.1379
	[0.126]	[0.130]
Monostate	0.8405***	0.8171***
	[0.193]	[0.198]
Age	-0.7177***	-0.9829***
	[0.148]	[0.152]
NonProfit Indicator	-0.8157*	-0.8232*
	[0.464]	[0.477]
Constant	-12.2761***	-12.9470***
	[0.989]	[1.018]
Observations	4,573	4,573
R-squared	0.7324	0.7482

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1
Company-fixed effects included
Source: Authors' analysis of health insurer data from the NAIC, AHIP and state statutes for the years 2001–2014. Notes: Analyses control for firm-specific effects. Clustered standard errors used. All continuous variables are transformed using natural logarithm.

Additional Analyses

While a number of insurers operated in multiple states during the sample period, the majority operated in only one state. Specifically, 464 of the insurers, nearly 93%, fall into this category. To test the robustness of the results, we construct several variations of the models presented in Table 4. First, we include a variable that represents the total number of states in which the insurer operates instead of the monostate indicator. Next, we exclude insurers that operate in large number of states, defined as more than three. Finally, we exclude insurers that operate in multiple states. As such, the final set of models only includes insurers that operate in either a state with an MLR requirement or a state without an MLR requirement. Results for these three model variations are presented in Table 5.

Table 5:
Alternate Controls for Extent of Activity in States

	Include Total States Variable		3 or Fewer States		MonoState Insurers	
	Premiums Earned	Member Months	Premiums Earned	Member Months	Premiums Earned	Member Months
NoStateMLR	0.8883***	0.8557***	1.0013***	1.1281***	-0.3644	-0.8745
	[0.104]	[0.107]	[0.125]	[0.134]	[1.278]	[1.377]
Post-ACA	-0.0686	-0.0658	-0.1932**	-0.1571*	-0.0711	-0.0431
	[0.090]	[0.093]	[0.086]	[0.092]	[0.082]	[0.088]
NoStateMLR*Post-ACA	-0.3756***	-0.3507***	-0.3504***	-0.2920**	-0.4167***	-0.3179***
	[0.111]	[0.115]	[0.107]	[0.115]	[0.103]	[0.110]
Size	0.7076***	0.7835***	0.6554***	0.7490***	0.6744***	0.7761***
	[0.080]	[0.082]	[0.071]	[0.075]	[0.064]	[0.069]
Capitalization	-0.6674***	-0.7637***	-0.6807***	-0.7692***	-0.6744***	-0.7526***
	[0.107]	[0.111]	[0.094]	[0.101]	[0.084]	[0.091]
Mutual	-0.4586	-0.5766	-0.4899	-0.6205	-1.2657**	-1.4606**
	[0.518]	[0.534]	[0.446]	[0.477]	[0.628]	[0.676]
Group	0.1076	0.1465	0.1488	0.1727	0.0821	0.1143
	[0.187]	[0.192]	[0.161]	[0.172]	[0.143]	[0.154]
Percent Group Insurance	-0.0550	0.1259	-0.3525**	-0.1143	0.3531**	0.8300***
	[0.127]	[0.130]	[0.155]	[0.166]	[0.173]	[0.186]
Age	-0.7308***	-0.9686***	-0.6523***	-0.9475***	-0.4194***	-0.6783***
	[0.149]	[0.153]	[0.131]	[0.140]	[0.114]	[0.122]
NonProfit Indicator	-0.9568**	-0.9538**	-0.9291**	-0.9403**	-1.1495***	-1.0933**
	[0.464]	[0.477]	[0.399]	[0.427]	[0.409]	[0.441]
Total States	-0.0247	0.0104				
	[0.020]	[0.020]				
Constant	-11.3002***	-11.9640***	-10.3724***	-11.1063***	-10.8245***	-11.6041***
	[0.964]	[0.993]	[0.830]	[0.888]	[1.000]	[1.077]
Observations	4,573	4,573	3,890	3,890	3,078	3,078
R-squared	0.7313	0.7472	0.7916	0.8011	0.8602	0.8661

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1
Company-fixed effects included
Source: Authors' analysis of health insurer data from the NAIC, AHIP and state statutes for the years 2001–2014. Notes: Analyses using quantile regression. Models are at 5th percentile, 25th percentile, 75th percentile and 95th percentile. Analyses control for firm-specific effects. Clustered standard errors used.

The results are generally consistent with what is reported in Table 4 for the full sample, with two exceptions. The *NoStateMLR* variable is not significant in the monostate insurer models. This suggests that insurers that focus operations in a single state may be better able to manage state MLR requirements so that these firms are not negatively affected by this regulation. We do also find that the *Post-ACA* variable is negative and significant in the models including only insurers operating in three or fewer states. This suggests that for insurers operating in just a few states, the ACA's MLR requirement negatively affected market share.

Next, we consider whether the effect of MLR requirements varies based on the extent of market share. The main analysis provides insight into the effect of the independent variables on the conditional mean of health insurer market share. However, the range of the market share held by a given insurer varies considerably, and a firm's ability to adapt to changes may be affected by its power in the marketplace. As noted in Harrington (2013), to the extent that MLR requirements result in greater economies of scale, it is possible that there could be substantial differences in the effect of state and federal MLR legislation depending on the extent of market share held by insurers. For example, insurers with larger market shares may be more or less affected by the state and/or federal MLR requirements relative to insurers with smaller market shares. To determine if this is the case, we conduct an additional analysis using quantile regression. This analysis allows us to examine the effect of factors, specifically the state and federal MLR requirements, on varying points along the distribution of market share, not just the conditional mean.[20] In this analysis, we consider insurers at the median and the extremes—the 5th and 95th market share percentiles. The results of this analysis are presented in Table 6 (on page 16). Here, market share is measured using premiums earned.

These quantile regression models yield some additional insights into the effect of the state and federal MLR requirements on insurers. As with the models reported in Table 4, we find that insurers operating in states with no existing MLR requirements have higher market shares compared to insurers operating in states with MLR requirements, except for insurers with very little market share. For the firms in the smallest quantile, state MLR requirements do not have a statistically significant effect on market share. We also find that the effect of the state MLR requirements tends to be greater for insurers with larger market shares.

The *Post-ACA* is also significant and negative for the insurers with low and median market shares, but the magnitude of the effect declines as market share increases. Additionally, for insurers with the largest market shares, *Post-ACA* is significant and positive, indicating that the federal MLR requirement positively affected insurers with the largest market shares. This varying effect based on market share may explain the lack of significance of the *Post-ACA* variable in Table 4.

Finally, when we consider the joint effect of the interaction between *NoStateMLR* and *Post-ACA*, we again find that post-ACA, market shares are lower

20. For more information on quantile regression analysis, see "Quantile Regression" by Roger Koenker (2000) at *www.econ.uiuc.edu/~roger/research/rq/rq.pdf*.

for insurers operating in states with no MLR requirement.[21] If this ultimately leads to increased market concentration and/or less competition in the marketplace, this could have long-term implications for consumers.

Table 6:
Quantile Model Results

	Percentiles		
	5	**50**	**95**
NoStateMLR	-0.0112	0.5483***	0.6512***
	[0.103]	[0.082]	[0.207]
Post-ACA	-0.7183***	-0.1169***	0.0829***
	[0.122]	[0.041]	[0.015]
NoStateMLR*Post-ACA	-0.1585	-0.1381***	-0.1485***
	[0.109]	[0.046]	[0.016]
Size	0.9094***	0.5213***	0.4319***
	[0.179]	[0.041]	[0.018]
Capitalization	-0.4275***	-0.3557***	-0.7074***
	[0.069]	[0.043]	[0.027]
Mutual	-1.8063	-0.1180	0.1280
	[2.114]	[0.200]	[0.094]
Group	0.2573***	0.0690	0.0603*
	[0.085]	[0.050]	[0.031]
Percent Group Insurance	0.0353	-0.1951	-0.7043***
	[0.209]	[0.143]	[0.170]
Monostate	2.6403**	0.0783	-0.4348***
	[1.116]	[0.100]	[0.028]
Age	-0.5098**	-0.7389***	-1.1196***
	[0.213]	[0.119]	[0.090]
Non-Profit	-1.6072	-0.9058***	0.1160
	[2.236]	[0.283]	[0.141]
Constant	-22.0064	-12.4445**	-9.8758***
	[48.180]	[6.138]	[0.794]
Observations	4,573	4,573	4,573

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1
Company-fixed effects included
Source: Authors' analysis of health insurer data from the NAIC, AHIP and state statutes for the years 2001–2014. Notes: Analyses using quantile regression. Models are at 5th percentile, 25th percentile, 75th percentile and 95th percentile. Analyses control for firm-specific effects. Clustered standard errors used.

21. The results using member months as a measure of market share are consistent with the results presented in Table 6.

Conclusion

Overall, our study indicates that MLR regulations have significant consequences for the market share held by insurers in the individual health insurance marketplace. We find evidence that insurers operating in states with MLR regulations in place prior to the ACA generally had lower market shares than insurers operating in states without pre-ACA MLR regulations. Consistent with the notion that MLR regulations are associated with reductions in an insurer's market share, we also find evidence that the ACA MLR regulations led to greater reductions in market shares of individual health insurers operating in states with no prior MLR regulations.

To the extent that the MLR is a measure of the price-to-cost ratio, our results suggest that MLR regulations may limit individual insurers' ability to leverage the price-enhancing benefits of market power. As a result, a given individual health insurer's market share is generally lower under MLR regulations. This may also reflect a shift into other lines of business not subject to MLR regulations (e.g., disability or long-term care insurance) by individual health insurers in response to the profit-limiting MLR regulations. In either case, states that relax the MLR requirement may experience a more concentrated market which could lead to fewer choices for consumers. Additionally, the potential MLR change has to be considered in conjunction with other changes made to the ACA, specifically the removal of subsidies to insurers for providing lower deductibles and out-of-pocket costs to low income individuals. This may make providing individual coverage less attractive to insurers, resulting in further concentration within the industry. Given the uncertainty surrounding the future of the ACA, our study provides policymakers with some insight into the potential effect of state changes to MLR requirements, and other provisions for health insurers and potentially the health insurance marketplace overall. However, it will likely take several years before the effect of these recent changes are known.

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Director Networks and Credit Ratings of Insurance Companies

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Abstract

Previous finance literature has found that a firm's credit rating is influenced by the connectedness of its board members. Due to the subjective nature of credit ratings, qualitative information like a board's connections can influence a rating agency's decision making. We investigate the impact of four dimensions of board connectedness on credit ratings in the highly-regulated insurance industry. We find mixed evidence regarding the relationship between board connectedness and credit ratings in the insurance industry. As is the case for non-financial companies, we find some evidence that board connectedness is positively related to credit ratings for property/casualty (P/C) insurers, in line with social capital theory. However, for life insurers, we find that board connectedness is negatively associated with credit ratings, which supports the "board-busyness" theory. We suggest that the differing relationships between board connectedness and credit ratings among insurers are due to the short-term and riskier nature of property insurers, and that the disconnect between life insurers and non-financial companies is explained by life insurers' greater size, lower liquidity and higher leverage.

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Introduction

The insurance industry's stability is increasingly vital to overall economic health (Das, Davies and Podpiera, 2003). Although traditionally stable, risk-taking within the sector has increased as insurance companies diversify into products traditionally offered by banks and wealth management firms. Investment losses within these products, along with miscalculations in underwriting, can befall an insurance company; and those risks can reverberate throughout the economy. As such, more stringent regulations, requiring increased financial reporting, have historically been required by state insurance regulators to strengthen insurers' solvency (Klein, 1995). BarNiv and Hershbarger (1990) highlight the concerns the NAIC has in avoiding insurance company failures.

Credit rating agencies (CRAs) assign scores based on the perceived likelihood of default and a firm's perceived solvency. In their assessments, CRAs appropriately consider financial information relevant to a firm's economic health. However, credit ratings are not assigned based on financial information alone. Acknowledging the presence of asymmetric information, CRAs attempt to close the information gap by relying on qualitative information (Frost, 2007). Recent research has shown that one mechanism that CRAs consider is director connections, both in the form of social capital (Benson, Iyer, Kemper and Zhao, 2018) and also the direct connections that boards have with a CRA (Khatami, Marchica and Mura, 2016). However, both of these papers exclude insurance companies from their sample, arguing that a tight regulatory environment in this sector might compromise their results.

We revisit Benson et al. (2018) to examine how a tighter regulatory environment affects the need for qualitative information. Benson et al. argue that CRAs rely on the trustworthiness of the members of a firm's board of directors to close the information gap and proxy for trustworthiness by examining the directors' social capital. Their results show that firms which employ a highly connected board receive higher credit ratings. Following the work of Belliveau, O'Reilly and Wade (1996) and Paldam (2000), the authors relate the social capital of the board to trust. This social capital is built by expanding one's personal network, which increases an individual's reputation. Once earned, an individual is likely to behave in a manner that preserves that reputation.

Due to regulatory agencies requiring insurance companies to disclose significant additional financial information, we argue that this sector warrants investigation to better understand the relationship between board connectedness and credit ratings. We are motivated to examine the role that stringent regulations play in CRA decision making in the presence of additional financial constraints. Using a global sample of 10,973 firm-year observations, including both insurers and non-insurers, we find mixed evidence regarding the relationship between board connectedness and credit ratings. Regarding P/C insurers, we find some evidence of results similar to Benson et al. (2018). Namely, we see a positive relationship between board connectedness and credit ratings in two of our four measures, suggesting that CRAs may value the social capital of highly connected board

members. Given that property insurers face more claim volatility and a much higher potential for underwriting losses, this seems plausible. However, the same relationship does not exist regarding life insurers. In fact, when examining life insurers, we find evidence that board connectedness is associated with lower credit ratings. This result is consistent with the "board busyness" theory (Fich and Shivdasani, 2006). This theory posits that boards containing members with many commitments, which are more likely to be classified as highly-connected in our sample, actually result in weaker corporate governance. Taken in concert, our findings suggest that the impact of board connectedness is different for P/C firms and life insurance firms. Property insurers face more unpredictability, and thus risk, in their operations than life insurers, which could account for the opposite relationship between board connectedness and credit ratings seen in our results. In our sample, our results suggest that the connectedness of boards leads to lower credit rating for life insurers. One possible explanation for this result, which is the opposite found by Benson et al. (2018) for non-financial firms, is that the larger size, greater leverage and lower liquidity of life insurers (relative to both P/C firms and non-financial firms) explains why CRAs react differently to board connectedness for life insurers, because the detrimental effects of a "busy board" are greater at larger, more highly levered, and less liquid firms.

The first contribution of our paper is to analyze the impact of board connectedness on CRA's decision making in a highly regulated industry. State insurance regulators recognize the systemic importance of insurance companies and provide oversight. A natural question would be to examine whether the regulatory oversight of insurers negates the impact of board connectedness on CRAs found in prior studies. Specifically, if state insurance regulators trust the additional financial information required of insurers, they may not consider board connectedness. From our results, some evidence exists that CRAs appear to consider board connectedness at property insurers in a way similar to that of non-financial companies, meaning that higher board connectedness is positively associated with credit ratings. Our results suggest that CRAs consider highly connected boards negatively with respect to life insurers. This result stands in contrast to the work of Benson et al. (2018), while our results for P/C insurers tend to support it.

Our second contribution is to add to the literature that focuses on understanding the rating process. Graham and Harvey (2001) illustrate the importance that firms place on their ratings as chief financial officers (CFOs) list a firm's credit rating as a top priority. Dichev and Piotroski (2001) also show that credit ratings affect firm investment decisions. Additionally, both bond and equity markets react to changes in credit ratings (Hand, Holthausen and Leftwich, 1992). Because investment decisions are made with ratings in mind and stockholder wealth is affected by changes in ratings, the analysis of the rating process is valuable to managers and investors alike. However, the rating process is not fully transparent, nor does the rating process rely solely on firm financials (Frost, 2007). Therefore, this paper's focus is on revealing another qualitative measure that CRAs likely consider.

There also exists rating literature that is specific to insurers. Pottier and Sommer (1999) show the value that insurers place on their own ratings. Chen, Gaver and

Pottier (2018) highlight insurer stock return movements associated with changes in ratings. Halek and Eckles (2010) also highlight equity reactions to changes in insurance company ratings, confirming the effect that ratings have on stockholder wealth. Much research has hence been devoted to understanding the rating process. This paper adds to the evidence that the rating process is a function of the regulatory environment each industry faces.

Hypothesis Development and Methodology

CRAs create a numerical measure which attempts to quantify default probability. In the process, analysts rely on financial ratios and other quantitative information. However, financial information alone does not capture the entire process. Instead, the final credit rating reflects qualitative information (Odders-White and Ready, 2006). Benson et al. (2018) introduce social capital into the equation and show that, in non-financial companies, CRAs consider the connectivity of the boards of directors in their assessment. The authors argue that CRAs expect a board that is well-connected to take steps to maintain its reputation and do its duty. As such, the credit rating for firms with well-connected boards is higher than the financial models would suggest, ceteris paribus.

BarNiv and Hershbarger (1990) stress that the Insurance Regulatory Information System (IRIS), developed by the NAIC, will take immediate action when firm financials move outside preferred limits. Over time, the implementation of the NAIC's Financial Analysis Solvency Tools (FAST) ratios and risk-based capital standards further refined information provided to state insurance regulators. Because the insurance sector is highly regulated and remedial actions are swift, we consider a natural experiment in which firms that face more stringent financial reporting standards are evaluated. Eckles and Halek (2012) ask how the rating process affects information dissemination for these firms. If firms are more transparent in their financial situation, then the need of CRAs for qualitative information decreases. Therefore, we hypothesize that CRAs rely less on qualitative information in the evaluation of highly regulated firms.

H1: The credit rating process for firms in a highly regulated industry is different from the rating process of other industries.

To test this hypothesis, we examine the credit ratings of insurance companies. Skipper and Klein (2000) discuss the role insurance companies play in an advanced economy. They also validate the existence of stringent reporting standards. Grace, Harrington and Klein (1998) also highlight the regulatory environment that insurers face. To conduct our experiment and further understand the credit rating process, we follow the board connection methodology used in Benson et al. (2018) and apply it to insurance companies. This methodology uses four measures of board connectedness: degree centrality, betweenness centrality, closeness centrality and eigenvector centrality.

Degree centrality counts the number of direct relations a person has. The second measure is betweenness centrality, which examines if a person is between two powerful individuals and therefore acts as a bridge. Closeness centrality considers how close a person is to others in a network. The assumption is that a person closer to information obtains information more quickly and therefore has more power. Lastly, eigenvector centrality measures the importance of the person to which one is connected. For example, a person may have few connections. However, if that person is connected to another person who is highly connected, then eigenvector centrality would be high.

Data and Variables

Ratings of insurance companies have historically been dominated by A.M. Best, spanning a hundred-year history. In the 1980s, Standard & Poor's (S&P) entered this market and currently rates more than 80% of the insurance industry (Doherty, Kartasheva and Phillips, 2008). Our methodology involves examining the relation between board connectedness, using measures from BoardEx data, and credit ratings measured by the S&P Domestic Long-Term Issuer Credit Rating variable in the Compustat database. Benson et al. (2018) find a positive relation between board connectedness and credit ratings. Following their methodology, we construct models that include both insurers and non-insurers in a global regression, and then insert dummy variables for both life insurers and property insurers. We then examine the relation between board connectedness and credit ratings for: 1) non-insurers and life insurers; and 2) non-insurers and property insurers.[1] The coefficient on an interaction term of the dummy variable for the insurers and board connectedness will yield evidence about the relationship between board connectedness and credit ratings for the insurers in the sample. Using this methodology precludes the use of A.M. Best ratings, because they exist only for insurers. Based on the work of Doherty, Kartasheva and Phillips (2008), we are confident that the S&P rating is an appropriate measure of creditworthiness for insurance companies.

We gather ratings data from Compustat, excluding firms with a rating below C, as these firms are near default and could taint results (Behr, Kisgen and Taillard, 2015). To create our dependent variable *RATINGS*, we follow an inverse coding system in which an "AAA" rating takes on a value of 1 and a rating of "C" takes on a value of 21. All other financial information is also gathered from Compustat. We construct our connectivity measures using BoardEx and examine the years 1999 through 2011, focusing on professional relationships.

1. We identify life insurance companies (property insurance companies) as those companies with 63 (64) as their two-digit Standard Industrial Classification (SIC) code.

Board Connectedness Variables

We calculate betweenness centrality as the scaled value of the shortest number of connections that pass through a director. A director can be highly-central if she occupies pivotal bridge positions between other boards, making her a key proxy for information transfer. Let $d_{st}(i)$ denote the number of shortest paths between directors *s* and *t*, with director *i* being an intermediate connection; and let d_{st} (*i*) denote the total number of shortest links that connect directors *s* and *t* (including those that involve director *i*). *Betweenness centrality* for director *i* is measured as

$$C_B(i) = \sum_{s \neq t \neq i} \frac{d_{st}(i)}{d_{st}}$$

and the scaled measure is given as

$$C_B^*(i) = \frac{2}{(n-1)(n-2)} C_B(i)$$

Closeness centrality is defined as the measure of closeness to all other participants in the network. A highly connected director is closer to many other nodes. Let $d(i, j)$ denote the shortest number of steps that connect director *i* to director *j* in the network. From director *i*'s perspective, the value

$$\sum_j d(i,j)$$

denotes the total number of (shortest) steps taken to connect with all other directors in the network. The measure of 'shortest' captures *closeness*. The inverse of this measure is denoted by

$$C_C(i) = \frac{1}{\sum_j d(i,j)}$$

and measures *closeness centrality*, where values indicate how closely tied director *i* is to other directors in the network. The scaled measure is

$$C_C^*(i,j) = (n-1) C_C(i)$$

We define degree centrality as the scaled number of connections possessed by a director. A director can be highly influential if she is a member of multiple boards

delivering many relationships and channels of information transfer resulting in value enhancing opportunities and increased trustworthiness. In other words, *degree centrality* is the total number of connections possessed by a director. *Degree centrality* is measured as follows. Let A_{ij} denote a matrix containing a value of 1 if directors i and j are connected and 0 otherwise. Let $C_D\ (i)$ denote the number of nearest neighbors to director i,

$$C_D(i)=\sum_j A_{ij}$$

and scaled degree centrality is

$$C_D^*(i)=\frac{1}{n-1}C_D(i)$$

where n is the number of directors in the network.

Finally, we turn our attention to eigenvector centrality, which is derived from degree centrality. There may be instances when a director is closely connected with another director who might be highly influential within multiple clusters. Such a less-than well-connected director benefits from the connections possessed by their immediate connections, which can sometimes be construed as a parasitic effect. Let v_i denote the importance of director i. The value of v_i depends on the value of v_j for director j if director i is connected to director j. If we consider all directors in the network, v_i is determined by

$$\sum_j A_{ij}v_j$$

To compute v_i, suppose we assign a value of 1 to each director's importance and recursively determine v_i; by the following relation

$$v_i \leftarrow \sum_j A_{ij}(v_j)$$

the values increase in size without bound. To normalize this process, let

$$\lambda$$

be a normalizing constant such that

$$v_i = \frac{1}{\lambda} \sum_j A_{ij}(v_j)$$

In matrix notation, this is written as

$$Av = \lambda v$$

The constant

$$\lambda$$

is easily seen as an eigenvalue measure. The eigenvector associated with the largest eigenvalue indicates the measure of each director's importance in the network. In the next section, we describe the data and other variables.

Control Variables

We consider control variables used in Park, Xie and Rui, (2018); Behr, Kisgen and Taillard (2015); and Blume, Lin and Mackinlay (1998), and see that all of these emphasize measures of size, leverage and liquidity as control variables[2] when examining credit ratings and board connectedness. In this paper, we only use the control variables that are prevalent in the most recent highly cited papers in this area, alleviating concerns of multicollinearity among control variables. We define size as the natural log of total assets. Leverage is defined as the total liabilities to net worth (surplus). Net worth is defined as the difference between assets and liabilities. Liquidity is defined as the ratio of cash and equivalents to total assets. We expect size to be negatively related to our dependent variable, *RATINGS*, because larger firms tend to have higher credit ratings. We expect leverage to be positively related to our dependent variable due to the fact that more highly leveraged firms tend to have lower credit ratings. Finally, liquidity is expected to be negatively related to our dependent variable meaning that more liquid firms tend to be viewed more favorably by CRAs.

Summary Statistics

Table I presents our summary statistics. In our sample, we see that the average publicly-traded company has a rating of 10 (BBB-) and an average publicly-traded life insurance company has a rating of 8 (BBB+), while the average property

2. Recently, Benson et al. (2018) used size, leverage, interest coverage and operating margin as their controls.

publicly-traded insurance company has a rating of 10 (BBB-). The average firm in our sample has approximately $4 billion in assets, life insurance companies have $14 billion in assets, and average property insurance companies have $3.3 billion in assets. Firms have liabilities that are almost 2.83 times greater than surplus, whereas life insurance companies have liabilities that are six times greater than surplus, and property insurance companies have liabilities that are three times greater than surplus. Firms in the overall sample have a liquidity ratio of 30%, whereas life insurance companies maintain a liquidity ratio of 22%, and property insurance companies maintain a liquidity ratio of 28%.

Table I:
Summary Statistics

Panel A: All Companies

Variable	MEAN	MEDIAN	STD DEV	N
Rating code	10	10	3	10978
Size	8.2313	8.0765	1.5590	10978
Leverage	2.8333	1.7619	58.4746	10973
Liquidity	0.3015	0.3229	0.2420	10978

Panel B: Life Insurance Companies

Variable	MEAN	MEDIAN	STD DEV	N
Rating code	8	8	3	586
Size	9.5728	9.5490	1.5607	586
Leverage	5.7635	3.9753	5.7775	586
Liquidity	0.2221	0.1928	0.1475	586

Panel C: Property Insurance Companies

Variable	MEAN	MEDIAN	STD DEV	N
Rating code	10	12	3	36
Size	8.1313	7.2319	1.6411	36
Leverage	3.1253	2.5643	2.1449	36
Liquidity	0.2874	0.2775	0.1131	36

This table presents the summary statistics of the sample. Rating is provided by Compustat. An inverse coding system starting with an "AAA" rating, which is coded as 1, and a "C" rating, which is coded as 21. Firms with a "D" rating, an "SD" rating and no rating are dropped. Size is defined as the natural log of total assets. Leverage is defined as the total liabilities to surplus (net worth). Net worth is defined as the difference between assets and liabilities. Liquidity is defined as ratio of cash and equivalents to total assets.

Panel A of Table II (on page 11) presents the univariate statistics for our centrality variables for the entire sample. The centralities are normalized to the entire network, hence the values seem small. Normalization allows for the comparison of nodes of different sizes (Chuluun, Prevost and Puthenpurackal, 2014; El-Khatib, Fogel and Jandik, 2015). Board level centralities are combined from individual director level values. We use the interpretation in Fogel, Ma and Morck (2014) to explain our raw centrality variables. The mean (median) *betweenness centrality* is 0.00013 (0.00007), which means that the average director sits in about 7,700 paths (1/.00012 = 7,692.30). A director in the 75th percentile sits in about 7,140 paths. The mean (median) value for *closeness centrality* is 0.3135 (0.3147). A *closeness centrality* measure of 0.3135 indicates that a typical director is about (1/0.3135 = 3.18) degrees of separation from any other randomly chosen director in the network. The mean (median) value for *degree centrality* is 0.00133 (0.0010). A higher value means a larger number of connections. The mean (median) value for *eigenvector centrality* is 0.00160 (0.00080). *Eigenvector centrality* does not provide an intuitive interpretation beyond our description in Section 2, but a higher value certainly means that, on average, the directors are connected with other powerful directors in the network. Panel B presents the pairwise correlations between the centrality variables and ratings. The centrality variables are positively correlated with themselves, suggesting that they measure similar board member characteristics. The results in Table II support the findings in Chuluun, Prevost and Puthenpurackal (2014).

Panel C repeats the analysis for life insurance companies. The mean (median) *betweenness centrality* is 0.00012 (0.00007), which means that the average director sits in about 8,300 paths (1/.00012 = 8333.33). A director in the 75th percentile sits in about 7,140 paths. The mean (median) value for *closeness centrality* is 0.3154 (0.3173). A *closeness centrality* measure of 0.3154 indicates that a typical director is about (1/0.3153 = 3.17) degrees of separation from any other randomly chosen director in the network. The mean (median) value for *degree centrality* is 0.00139 (0.00117). The mean (median) value for *eigenvector centrality* is 0.00179 (0.00101). Panel D presents the pairwise correlations between the centrality variables and ratings, and they agree with the results in Panel B.

Panel E of Table II presents the univariate statistics for our centrality variables for the property insurance companies. The mean (median) *betweenness centrality* is 0.00023 (0.00025), which means that the average director sits in about 4,300 paths. A director in the 75th percentile sits in about 4,000 paths. The mean (median) value for *closeness centrality* is 0.3217 (0.3272). A *closeness centrality* measure of 0.3217 indicates that a typical director is about (1/0.3153 = 3.10) degrees of separation from any other randomly chosen director in the network. The mean (median) value for *degree centrality* is 0.00197 (0.00176). Directors in the property insurance companies seem to have higher connections than directors in the life insurance companies. The mean (median) value for *eigenvector centrality* is 0.00304 (0.00168). Overall, we see that directors in the property insurance companies are marginally better connected than directors in the life insurance companies. Panel F

results are qualitatively similar to those in Panel B. Hence, we proceed to discuss the multivariate results.

Table II:
Board Network Centrality Measures

Panel A – Network Measures – All Companies

	Mean	SD	P25	Median	P75
Between	0.00013	0.00016	0.00004	0.00007	0.00014
Closeness	0.31358	0.01874	0.30235	0.31473	0.32630
Degree	0.00133	0.00100	0.00065	0.00106	0.00171
Eigen	0.00160	0.00274	0.00038	0.00080	0.00174

Panel B – Pairwise Correlation of Centralities for All Companies

	Rating	Between	Closeness	Degree
Between	-0.3287***			
Closeness	-0.2812***	0.5903***		
Degree	-0.3410***	0.8168***	0.8110***	
Eigen	-0.1450***	0.3425***	0.4325***	0.5488***

Panel C – Network Measures – Life Insurance Companies

	Mean	SD	P25	Median	P75
Between	0.00012	0.00017	0.00004	0.00007	0.00014
Closeness	0.31546	0.01900	0.30513	0.31734	0.32736
Degree	0.00139	0.00093	0.00069	0.00117	0.00180
Eigen	0.00179	0.00215	0.00046	0.00101	0.00225

Panel D – Pairwise Correlation of Centralities and Rating for Life Insurance Companies

	Rating	Between	Closeness	Degree
Between	-0.2998***			
Closeness	-0.1441***	0.5358***		
Degree	-0.2523***	0.7368***	0.8555***	
Eigen	-0.0095	0.2826***	0.5075***	0.5916***

Panel E – Network Measures – Property Insurance Companies

	Mean	SD	P25	Median	P75
Between	0.00023	0.00016	0.00005	0.00025	0.00034
Closeness	0.32172	0.01744	0.30589	0.32720	0.33799
Degree	0.00197	0.00103	0.00087	0.00176	0.00293
Eigen	0.00304	0.00531	0.00054	0.00168	0.00254

Panel F – Pairwise Correlation of Centralities and Rating for Property Insurance Companies

	Rating	Between	Closeness	Degree
Between	-0.6880***			
Closeness	-0.7525***	0.5730***		
Degree	-0.8058***	0.7763***	0.9116***	
Eigen	-0.0729	0.0763	0.3778***	0.4095***

This table provides the summary statistics for the centrality measures (non-standardized) for our sample. Panel A (Panel C) provides the summary statistics and Panel B (panel D) provides the pair-wise correlation tables of our centrality measures and ratings for life insurance companies (property insurance companies).

Results

Table III (on page 14) presents an ordered probit regression with credit ratings as the dependent variable and our board connections as independent variables. In our global regression, we use a dummy variable, *Insurance_Life (Insurance_Prop),* which takes on a value of 1 if the rated firm is a life insurance (property insurance) company. Employing a two-way fixed effects model controlling for year and industry, Panel A of Table III shows an inverse relation between our dependent variable and our life insurance dummy variable. This finding reveals that life insurance companies have higher credit ratings after controlling for each firms' financials. Panel A of Table III also supports the findings in Benson et al. (2018) and shows that board connections influence firm ratings for this sample, which includes both life insurers and non-insurers. A negative and significant relation between our dependent variable and each of the connectivity variables verifies that firms with connected boards enjoy a higher corporate rating. Panels A and B of Table III also show that larger, more liquid firms with slightly lower leverage have higher credit ratings.

In Table IV (on page 15), we introduce an interaction variable to examine if the connectivity of boards influence CRA decision making for insurers. This is the examination of our main hypothesis, which proposes that qualitative information, like board connectivity, will play a lesser role on the CRAs of firms in a highly regulated industry. Due to the regulatory obligation of providing additional financials, we hypothesize that CRAs would focus more on the available financial information. To study this hypothesis, we interact our insurance dummy variables with each of the connectivity variables. For P/C insurers, in Panel B of Table IV, we see that two of the four interaction variables are significant and negative, which, due to our inverse measure of credit rating, implies a positive relationship between board connectedness and credit rating. Consequently, we find some evidence that for P/C insurers, the impact of board connectedness on credit ratings is similar to that of non-financial firms; i.e., higher board connectedness appears to be associated with higher credit ratings for P/C firms, which aligns with Benson et al. (2018). The results for life insurers can be seen in Panel A of Table IV, where we see that three of the four interaction variables are significant and positive. In other words, when viewed in the isolation of the interaction variable, it appears that the connectedness of a life insurance company's board tends to be associated with lower credit ratings. We surmise that this may be due to life insurance companies' greater size, lower liquidity and higher leverage than other non-financial firms, and because of their greater predictability in operating results relative to property insurers. This finding should be of interest to state insurance regulators of life insurance companies, because it stands in contrast to the results of Benson et al. (2018), and instead supports the "board-busyness" theory of Fich and Shivdasani (2006) which found that boards composed of members with many commitments ultimately experienced weaker corporate governance. We posit that these contradictory findings among type of insurer are due to the nature of the risk to which these firms are exposed.

Specifically, life insurers' obligations are more predictable, and these firms hold asset portfolios that contain long-term bonds reflecting the nature of their obligations. The same cannot be said for property insurers. Underwriting losses can come in droves and are less predictable. Once again, the asset portfolio of a property insurer reflects this reality. Therefore, we posit that CRAs are more likely to rely on the social capital of the board and its sense of duty if losses mount to pay its obligations for P/C insurers, as is the case for non-financial companies. Because life insurers have more predictable outlays, they do not benefit as much from highly connected boards, and because they are larger and they have lower liquidity and higher leverage, overcommitted board directors represent a real risk to consider, which could also explain the contradictory result.

Sample Limitations

Our investigation seeks to extend and compare the findings of Benson et al. (2018) to examine if the same positive relationship between board connectedness and credit ratings exists for insurance companies. We rely on BoardEx data to construct measures of board connectedness and Compustat data for S&P ratings and other financial data. BoardEx data is limited to publicly traded companies. Our global regression methodology requires consistent data across examined companies. Consequently, though the great majority of insurance companies are not publicly traded, our investigation and results are limited to those that are.[3] This somewhat limits the generalizability of our results: unlike for other companies, there seems to be no relationship between board connectedness and credit ratings. This is an interesting finding for publicly traded insurers, but we cannot extend that finding to the broad category of insurers because most are not publicly traded. Future research in this area could serve to clarify the relationship between board connectedness and credit ratings for insurers by examining insurers that are not publicly traded.

3. For example, our entire sample, spanning 13 years, contains 586 (36) life insurer (P/C insurer) usable observations, while the Insurance Information Institute (I.I.I.) reports 1,730 (2,538) life-health (P/C) insurers operating in 2016.

Table III:
Ratings and Board Connectivity

Panel A (includes global sample and life insurers)

Variables	Rating	Rating	Rating	Rating
Insurance_Life	-0.3221**	-0.3094**	-0.3105**	-0.3113**
	(-2.4674)	(-2.3374)	(-2.3492)	(-2.3788)
Betweenness	-0.1260***			
	(-3.8138)			
Closeness		-0.0770***		
		(-2.7608)		
Degree			-0.1379***	
			(-5.3489)	
Eigen				-0.0523***
				(-2.5778)
Size	-0.8966***	-0.9162***	-0.8854***	-0.9436***
	(-21.4577)	(-22.4552)	(-21.6308)	(-23.9655)
Leverage	0.0544***	0.0533***	0.0524***	0.0574***
	(3.1329)	(3.0337)	(3.0158)	(3.2934)
Liquidity	-0.3876***	-0.3887***	-0.3886***	-0.3849***
	(-14.7482)	(-14.8495)	(-14.9064)	(-14.6129)
Observations	10,937	10,937	10,937	10,937
Industry Filing Exemption (FE)	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Pseudo R-squared	0.152	0.151	0.153	0.151

Panel B (includes global sample and property insurers)

Variables	Rating	Rating	Rating	Rating
Insurance_Prop	0.0468	-0.0025	0.0814	-0.0412
	(0.2349)	(-0.0135)	(0.4477)	(-0.2042)
Betweenness	-0.1262***			
	(-3.5989)			
Closeness		-0.0893***		
		(-3.1135)		
Degree			-0.1459***	
			(-5.5492)	
Eigen				-0.0581***
				(-2.8409)
Size	-0.9128***	-0.9278***	-0.8984***	-0.9596***
	(-20.8877)	(-21.8622)	(-21.0759)	(-23.3905)
Leverage	0.0488***	0.0459***	0.0460***	0.0507***
	(2.7697)	(2.5769)	(2.6134)	(2.8706)
Liquidity	-0.3826***	-0.3834***	-0.3839***	-0.3788***
	(-14.2769)	(-14.3779)	(-14.4388)	(-14.1076)
Observations	10,387	10,387	10,387	10,387
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Pseudo R-squared	0.152	0.151	0.153	0.152

This table presents the ordered probit regression results of ratings against centralities and other control variables. The dependent variable is Ratings. Insurance_Life (Insurance_Prop) is a dummy variable that takes on a value of 1 if the firm is a life insurance firm (a property insurance firm). Size is defined as the natural log of total assets. Leverage is defined as the total liabilities to surplus (net worth). Net worth is defined as the difference between assets and liabilities. Liquidity is defined as the ratio of cash and equivalents to total assets. Two-way fixed effects with industry and year are employed with firm-level clustered standard errors. Control variables are winsorized at the 1% level and then standardized. T-statistics in parenthesis. Coefficients significant at the 1%, 5% and 10% level are marked by ***, ** and *, respectively.

Table IV:
Ratings and Board Connectivity – With Interactions

Panel A (includes global sample and life insurers)

Variables	Rating	Rating	Rating	Rating
Insurance_Life	-0.3214**	-0.3360***	-0.3225**	-0.3282**
	(-2.4786)	(-2.6234)	(-2.4755)	(-2.5175)
Betweenness	-0.1323***			
	(-3.6820)			
Insurance_Life*Betweenness	0.1038			
	(1.1279)			
Closeness		-0.0942***		
		(-3.2938)		
Insurance_Life*Closeness		0.3052***		
		(3.0948)		
Degree			-0.1503***	
			(-5.6930)	
Insurance_Life*Degree			0.2558***	
			(2.5804)	
Eigen				-0.0610***
				(-2.9776)
Insurance_Life*Eigen				0.2761***
				(2.6117)
Size	-0.8965***	-0.9201***	-0.8879***	-0.9478***
	(-21.3879)	(-22.5404)	(-21.6749)	(-24.1464)
Leverage	0.0545***	0.0512***	0.0516***	0.0573***
	(3.1408)	(2.9243)	(2.9800)	(3.2836)
Liquidity	-0.3875***	-0.3875***	-0.3882***	-0.3845***
	(-14.7464)	(-14.8211)	(-14.8902)	(-14.6066)
Observations	10,937	10,937	10,937	10,937
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Pseudo R-squared	0.153	0.152	0.153	0.152

Panel B (includes global sample and property insurers)

Variables	Rating	Rating	Rating	Rating
Insurance_Prop	0.1095	0.0958	0.2159	-0.0620
	(0.6386)	(0.5943)	(1.2955)	(-0.2943)
Betweenness	-0.1260***			
	(-3.5917)			
Insurance_Prop*Betweenness	-0.1027			
	(-0.5784)			
Closeness		-0.0888***		
		(-3.0907)		
Insurance_ Prop *Closeness		-0.2237**		
		(-2.1687)		
Degree			-0.1453***	
			(-5.5165)	
Insurance_ Prop *Degree			-0.2096**	
			(-2.0572)	
Eigen				-0.0586***
				(-2.8293)
Insurance_ Prop *Eigen				0.0401
				(1.0533)
Size	-0.9127***	-0.9275***	-0.8981***	-0.9594***
	(-20.8820)	(-21.8505)	(-21.0667)	(-23.3781)
Leverage	0.0488***	0.0459***	0.0460***	0.0507***
	(2.7684)	(2.5767)	(2.6130)	(2.8706)
Liquidity	-0.3827***	-0.3835***	-0.3841***	-0.3788***
	(-14.2752)	(-14.3781)	(-14.4387)	(-14.1086)
Observations	10,387	10,387	10,387	10,387
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Pseudo R-squared	0.152	0.151	0.153	0.152

This table presents the ordered probit regression results of ratings against centralities and other control variables. We interact the centralities and the insurance dummies. The dependent variable is Ratings. Insurance_Life (Insurance_Prop) is a dummy variable that takes on a value of 1 if the firms is a life insurance firm (property insurance firm). Size is defined as the natural log of total assets. Leverage is defined as the total liabilities to surplus (net worth). Net worth is defined as the difference between assets and liabilities. Liquidity is defined as the ratio of cash and equivalents to total assets. Two-way fixed effects with industry and year are employed with firm-level clustered standard errors. Control variables are winsorized at the 1% level and then standardized. T-statistics in parenthesis. Coefficients significant at the 1%, 5% and 10% level are marked by ***, ** and *, respectively.

Conclusion

The regulatory environment for insurance companies is tighter than it is in other industries. More financial information is required and is thus available for CRAs to use. As such, we are able to analyze whether the connectedness of members of boards of directors affects the credit rating that the firm receives in a highly regulated industry. This adds to existing literature on board connectedness and credit ratings as prior studies exclude financial companies, among which are insurance companies.

Benson et al. (2018) find that board connectedness is positively correlated to credit rating; i.e., better connected boards are associated with higher credit ratings, ceteris paribus. However, we find that, though CRAs traditionally rely on both qualitative and quantitative information in their final rating assessment, we find differing effects when examining our interaction terms for life and property insurers. Specifically, we find some evidence that board connectedness is positively related to credit ratings for property insurers. Two of our four examined interaction terms demonstrate this relationship, which is similar to that of non-financial companies found by Benson et al. (2018). In contrast, when viewing the interaction terms, three of our four measures exhibit a negative relationship between ratings and board connectedness for life insurers. We suggest that these contrary results can be explained by the difference between the predictability of the operations of property and life insurers. Further, the larger size, greater leverage and lower liquidity of life insurers relative to non-financial firms could also indicate the costs predicted by the "board-busyness" theory of Fich and Shivdasani (2006).

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The Impact of Motor Vehicle Simulator Training on Law Enforcement Officer Driving Behavior: Empirical Evidence from Accident Frequency and Severity

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Abstract

Local Government Risk Management Services (LGRMS) indicates that its No. 1 loss within law enforcement continues to be related to motor vehicle incidents. In order to reduce the risk of these incidents from occurring in the future, LGRMS provides simulator training for its members. As documented by our review of the literature, a question that has remained largely unanswered by prior studies is the efficacy of this sort of training in mitigating risk management costs. In this study, we use accident loss cost data over the period 2000–2015 to determine whether motor vehicle simulator training is reducing loss frequency and severity, and whether such training is cost effective. Our analysis suggests that the training not only reduces accident frequency, and to some extent loss severity, but its return on investment (ROI) is 12:1. Given the recent concern over increasing motor vehicle loss frequency and severity in most states, our research has important implications

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for state legislative and regulatory authorities as they seek ways to mitigate growing motor vehicle loss costs. In addition to the benefits that we document for the use of motor vehicle simulator training of law enforcement officers (LEOs), our results suggest that efforts by state insurance regulators and legislators to facilitate and encourage motor vehicle simulator use as part of their state's licensing and insurance requirements would provide important benefits to the public in their state.

Introduction

Local Government Risk Management Services (LGRMS) provides risk control services for the Association County Commissioners of Georgia (ACCG) and the Georgia Municipal Association's (GMA) workers' compensation and property/liability insurance pools. These pools provide insurance for thousands of police and sheriff's deputies across Georgia, as well as the public entities for which they work.

LGRMS indicates that its No. 1 loss within law enforcement continues to be related to motor vehicle incidents. In order to reduce the risk of these incidents from occurring in the future, LGRMS utilizes training activities that focus on the behavior of law enforcement officers (LEOs) that contribute to incidents. As one important example of such behavioral-focused activities, LGRMS provides simulator training for its members. LGRMS has three mobile units that provide pursuit/emergency vehicle operator courses (EVOCs) and distracted driving simulation training (law enforcement driving simulators—LEDS).

As documented by our review of the literature, a question that remains largely unanswered by prior studies is the efficacy of this sort of training in affecting driving behavior and in mitigating risk management costs. A primary gap that exists in the study of LEDS training is how the reduction in officer-involved traffic crashes (OITCs) ultimately affects reductions in insurance premiums, liability costs, workers' compensation and officer downtime. There is some data from prior studies, but it is limited in nature.

LGRMS not only provides motor vehicle simulator training to its members, but it also oversees the loss cost data for motor vehicle accidents involving LEOs employed by its members. As a result, LGRMS is in a unique position to facilitate the analysis conducted in this study.

Overview of the Study

This paper reviews the findings of our study of the data provided by LGRMS on auto liability and property damage costs associated with motor vehicle accidents involving LEOs employed by ACCG- and GMA-member counties and municipalities. The paper is organized as follows. First, we provide a detailed review of the existing literature relating to the impact of driving simulator training on reducing motor vehicle accidents. This includes some recommendations related

to driving simulator use and the effects on driving behavior based on our review of these prior studies. Second, we describe the methodology, data and statistical analysis used in this study. Third, we report on the results and empirical findings of our analysis of the ACCG and GMA law enforcement data and report on our estimates of the fiscal cost reductions associated with this training. Fourth, we provide data from LGRMS on its estimated annual costs associated with the driver simulator training that it provides to its members and highlight the estimated ROI that we find. Finally, we summarize our findings and report on future areas for research relative to the efficacy of motor vehicle simulator training of LEOs in mitigating risk management costs.

A key question that we seek to address in this study is whether any reduction in motor vehicle accident frequency and/or severity associated with the motor vehicle simulator training provided by LGRMS to its members offsets the costs of providing this training. Further, the recent concern over increasing motor vehicle loss frequency and severity in most states means that our research also has important implications for state legislative and regulatory authorities as they seek ways to mitigate growing motor vehicle loss costs. In addition to the oversight responsibilities that state insurance regulators and legislators have relative to motor vehicle accident costs and related impacts on insurance costs, these public policymakers also oversee motor vehicle licensing and associated training requirements for motor vehicle operators in their states. Cost-effective training strategies are not only important for motor vehicle loss mitigation associated with LEOs in their states, but they are important for commercial and private passenger motor vehicle operators, as well.

Review of the Existing Literature on the Effectiveness of Driving Simulators in Reducing Motor Vehicle Losses

The purpose of this review is to provide background information on some of the prevailing benefits to using driving simulators to train LEOs in order to reduce department costs. The most important correlation this literature review seeks to establish is between the frequency of OITCs and insurance premiums, liability costs, workers' compensation and officer downtime. In short, if law enforcement departments can reduce the number of OITCs, department costs will decrease. Additionally, this review examines the operational cost savings that come from using simulators in LEO training. The review is organized by first presenting important findings, identifying gaps in existing research, and making recommendations.

Reducing the Number of OITCs

An important finding in prior studies is that the use of LEDS to train LEOs reduces the number of OITCs. More broadly, better training will result in fewer OITCs. An analysis of this finding begins with a look at LEO driving training as a whole. Two main methodologies are used to turn LEOs into capable drivers: 1) "behind-the-wheel" training in EVOCs; and 2) simulated scenarios in LEDS training.[1] The EVOC is the most basic form of skills-based driver training and focuses on teaching LEOs to be proficient drivers. EVOC training requires that an LEO practice his/her driving skills in an actual vehicle, in the presence of a certified instructor, on a closed driving track or course. On the contrary, LEDS training focuses on decision-making, presenting worst-case scenarios to LEOs in non-life-threatening situations. Law enforcement departments around the nation utilize various combinations of these methodologies to train LEOs, and a 2009 report published by the California Commission on Peace Officer Standards and Training (POST) studied the effectiveness of EVOC training and LEDS training in a group of 7,431 LEOs.[2]

The study first looked at the effect of EVOC-only training on the number of OITCs. About 52% of LEOs without any form of EVOC training (and no LEDS training) were involved in an OITC in the study period, but only 48% of the LEOs with EVOC training (but still no LEDS training) were involved in an OITC in the study period. The study claims that the 4% reduction is statistically significant, and evidence that the use of EVOC as the sole component of an LEO training regimen will reduce the number of OITCs.[3]

The study then looked at the effect of LEDS-only training on the number of OITCs. About 55% of LEOs without any form of LEDS training (and no EVOC training) were involved in an OITC in the study period, whereas only about 47% of LEOs with LEDS training (but still no EVOC training) were involved in an OITC during the study period. Again, that 8% reduction is reported to be statistically significant, and evidence that the use of LEDS training as the sole component of an LEO training regimen will reduce the number of OITCs by more than a training regimen composed solely of EVOC training.[4]

Finally, the study looked at the effects of combining EVOC training and LEDS training. About 52% of LEOs without a combined EVOC/LEDS training were involved in an OITC in the study period, but only about 43% of LEOs that participated in a training program consisting of EVOC training and LEDS training were involved in an OITC in the study period. Again, the study claims that the almost 10% reduction is statistically significant and combining EVOC training and LEDS training will also reduce the number of OITCs.

1. California Commission (2009).
2. California Commission (2009).
3. California Commission (2009).
4. California Commission (2009).

The takeaway from this study is the determination that a training regimen consisting of both EVOC training and LEDS training is the most effective way to reduce the number of OITCs. The evidence suggests that while EVOC-only training can reduce the number of OITCs to a certain point, after that point, the incidence of OITCs is not as much related to LEO skill, but rather more directly linked to judgment and decision-making. More specifically, LEOs show better judgment and decision-making after they have experienced a situation that had legitimate potential to harm them.[5] For obvious reasons, the scenarios included in EVOCs cannot include legitimate life-threatening parameters. Similarly, EVOCs cannot accurately depict the driving conditions that LEOs should expect to see in the real world on a consistent basis.

The addition of LEDS training into a training regimen addresses these shortcomings and adds other key benefits. First, the LEDS training model is more focused on the judgment and decision-making aspects of driver training. According to Bob Davis, CEO of Virtual Driver Interactive, "[w]hen teaching fleet drivers, it's all about the decisions you make. It's less about the [vehicle] handling…"[6] Second, LEDS can make LEOs more aware of the consequences of their decisions, having been exposed to the worst-case scenario results of a potential OITC. In this way, LEDS do not speak to the eyes and ears of LEOs, but rather to their hearts and values.[7] Similarly, students learn more from failures than from successes.[8] Third, LEDS allow LEOs to practice driving in conditions that would be difficult to depict in an EVOC scenario, be it a replication of weather, time of day or traffic patterns. Likewise, LEDS allow LEOs to practice driving in a variety of different vehicles more easily; e.g., a high-speed pursuit in a Chevrolet Impala will require a different set of skills and decision-making expertise than will a high-speed pursuit in a GMC Yukon. Rather than purchase every type of vehicle an LEO would be likely to drive, a department can instead require LEOs to drive different types of vehicles in simulated scenarios. Finally, LEDS can allow for better recurrent training. The 2009 California POST report examines the advantages of LEO age and experience (identified as confounding factors).[9] From an age perspective, age does not always yield better driving. For example, even though an LEO may become a more skilled driver with age, that same LEO may also become more complacent. Additionally, while age builds confidence, self-confidence may exceed actual skill; i.e., an older police officer may think he is better at driving than he actually is. Similarly, more experience does not guarantee fewer OITCs. For example, officers with more experience may not drive as often, meaning that more overall experience may actually result in less competent drivers. Also, better LEOs may be assigned to drive more often; therefore, they may be subject to a higher rate of OITCs, even though they are considered to be better than the average LEO. These confounding factors

5. FAAC Incorporated.
6. Lockridge (2014).
7. FAAC Incorporated.
8. Raheb (2011).
9. California Commission (2009).

can be addressed more effectively and inexpensively in a LEDS training program rather than in an EVOC course. For all of the reasons listed, a law enforcement department can most effectively reduce the number of OITCs by including both EVOC training and LEDS training in a comprehensive training regimen.

In addition to the California POST report, other law enforcement departments have published studies that support the effectiveness of LEDS training in reducing OITCs. In 2005, the Utah Department of Public Safety (UDPS) sought to implement a new LEO training program that included both EVOC training and LEDS training.[10,11] In an initial rollout of the new training regimen to a group of 355 LEOs, the UDPS saw a "67% reduction in risk for collisions by reduction of critical errors."[12] Following the success of that initial rollout, the UDPS expanded the program to a larger group of LEOs and reaffirmed the initial findings; i.e., the inclusion of LEDS training has a measurable impact on reducing the number of OITCs.[13] In the United Kingdom (UK), the South Wales Police Roads Policing Unit began an integrated (EVOC and LEDS) form of LEO driver training in 2008, and it reported a 10% reduction in OITCs the first year.[14]

The use of LEDS training is not unique to the law enforcement industry. In trucking and transportation, Schneider National incorporated simulator training into its driver training program and saw a 21% reduction in preventable accidents in just the first 90 days.[15] Bison Transport, a trucking company based in Manitoba, Canada, implemented simulator training in 2002 and has seen an 83% improvement in mean time among incidents after simulator training for preventable accidents.[16] Logistics giant the United Parcel Service (UPS) saw a 38% reduction in collisions just one year after integrating simulators into its already extensive driver training program.[17] The New York City Fire Department Bureau of Emergency Medical Service (FDNY EMS) responds to more than 1.2 million calls for assistance every year, understandably creating a lot of opportunity for collisions.[18] In 2000, the rate of intersection collisions was about 40% of the total number of collisions; by 2007, after integrating simulators into the training program for EMS drivers, intersection collisions had declined to 11% of the total collision rate—a drop of about 75%.[19] The Utah Department of Transportation purchased snowplow simulators in order to allow its drivers to train year-round. The addition of simulators to the training program reduced the odds of a driver getting into a collision in the first six months

10. The UDPS had already been using a training program composed of EVOC training and LEDS training, but the LEDS course was essentially a "game-based situational-awareness exercise" that was not effective in simulating real-world hazards. The new training program which began in 2005 sought to increase the realness and effectiveness of the LEDS portion of the regimen.

11. Turpin et al. (2007).

12. Turpin et al. (2007).

13. Turpin et al. (2007).

14. RoadSafe (2010).

15. Lockridge (2006).

16. Lockridge (2006).

17. Lockridge (2014).

18. Raheb (2011).

19. Raheb (2011).

after training.[20] Other trades—including aviation, medical training, equipment maintenance, military combat and education—have also successfully implemented simulators into training programs.[21]

The law enforcement industry is not new to the use of simulators in LEO training either. In 1999, the National Institute of Justice (NIJ) provided funding to Eastern Kentucky University to study the effectiveness of the Professional Range Instruction Simulator (PRISim) system, a mobile, interactive firearms/judgment simulation system designed to enhance the ability of LEOs to determine the appropriate use of deadly force.[22] According to the final published report of the study, "[i]nteractive computer simulation systems can engross senses in a computer-generated environment and has allowed trainers to recreate diverse situations in a safe, realistic environment. Simulation can provide a means for practicing a particular skill, focusing on planning, assessment and improvement."[23] The study concluded that the simulation was effective in improving accuracy and the use of cover, avoiding the unintentional shooting of innocent bystanders, and ensuring the appropriate use of deadly force. Additionally, the study found that LEOs who participated in the training were overwhelmingly positive in their assessment of its effectiveness.[24] Based on the success of this case study, it is logical to presume that the law enforcement industry can see similar success in the widespread adoption of LEDS training, as well.

Other Cost Reductions

Other studies find that the inclusion of LEDS training in a department's training program can reduce department spending on training vehicles and related equipment, especially in the following key areas: fleet management; vehicle maintenance; and fuel. As stated in one article, "[simulators] don't need fuel or insurance; they don't put wear and tear on tires and components; and you don't need to worry about possibly damaging the [vehicle] while training the driver."[25]

Fleet Management

Many departments have different types of vehicles (cars, vans, sport utility vehicles (SUVs), etc.) by different manufactures (Ford, Chevrolet, etc.) of different ages (older vehicles with higher mileage drive differently than new vehicles).[26] In order to provide accurate and reliable training, a department would have to purchase all of the vehicles an LEO in that department could use. Instead, departments can

20. Strayer (2004).
21. Boosman (2007).
22. Justice and Safety Center (2003).
23. Justice and Safety Center (2003).
24. Justice and Safety Center (2003).
25. Lockridge (2014).
26. Yates (2009).

use LEDS to train LEOS in all of the vehicles they can expect to drive in the real world; changing the type of vehicle is as easy as clicking a button.

Vehicle Maintenance

Terry Godchaux of the Alameda County, California, Sheriff's Office estimates that to run the EVOC program, the department uses six instructors and 12 cars, and it goes through at least 10 tires daily.[27] If a department can shift a portion of EVOC participants to LEDS, that department may be able to save on costs, especially those attributed to vehicle damage as a result of inexperienced handling.

Fuel

Trucking company Schneider National has looked at the impact of training vehicle fuel costs on its bottom line. The company estimates that one hour of in-truck training consumes about two-and-a-half gallons of fuel.[28] At a price of $2 per gallon (and assuming similar consumption), it would cost a department about $5 per hour per vehicle to operate an in-car training scenario (note the variability in that estimate; as fuel costs increase, so do training costs). Another study suggests that actual car efficiency increases with simulator training because drivers become more adept at braking and accelerating more efficiently.[29]

Prior Studies in the Academic Literature

In addition to the industry and professional analysis reviewed above, a number of academic articles also discuss and analyze the impact of various driver training programs inside and outside of law enforcement on accidents and driving performance. This includes the use of driving simulators. Dorn and Barker (2005), using a police officer sample, investigate whether professionally trained and experienced drivers exhibit safer driving behavior in a simulated driving task compared with drivers without professional driver training. The professionally trained drivers were significantly less likely to engage in two forms of unsafe driving behavior than the drivers without professional training. They also discuss simulated driving performance with reference to the implications for driver training assessment and skill development.

Underwood et al. (2011) focus on assessing the comparability of driving on a road and "driving" in a simulator. The authors consider whether similar patterns of behavior are observed between individuals operating on road and individuals operating within simulators. Based on their analysis, they conclude that driving in the simulator will deliver representative results and the advantages of simulators (i.e., controlled environments, hazardous situations) can be appreciated. They suggest that this comparability encourages the use of simulators in driver training and testing.

27. FAAC Incorporated.
28. Kilcarr (2012).
29. Strayer (2004).

Outside of law enforcement, Beanland et al. (2013) sought to address the question of how effective driver training has been in improving on-road safety by newer drivers. They approached this question by conducting a comprehensive review of the literature for the period 2001–2011. Their review of prior studies suggests that traditional pre-license training programs have not reduced crash risk among young drivers. However, they found that post-license training programs, including those utilizing simulators, do show some evidence of effectiveness. However, they caution that it is unclear how transferable these are to other settings. They concluded that evaluations have generally demonstrated that training improves objective driving skills in simulated driving, especially when the scenarios are highly similar to those encountered in training.

Additionally, other academic studies review the effectiveness of simulator training applied to other aspects of law enforcement. On this last point, Arnetz et al. (2009) focus on testing the effects of police trauma resilience training on stress and performance in the context of a critical incident simulation. They found that officers trained using imagery and simulation training exhibited lower stress levels and better police performance.

Beanland et al. (2013) call for more robust research directed toward evaluating driver training programs, and our review suggests there is a gap in literature with respect to the value of driving simulator training in mitigating risk management costs.

Gaps Identified in the Research

The primary gap that exists in the study of LEDS training is how the reduction in OITCs ultimately affects reductions in insurance premiums, liability costs, workers' compensation and officer downtime. There is some data from prior studies, but it is limited in nature.

Insurance Premiums, Liability Costs and Workers' Compensation

Departments across the U.S. contend that LEDS reduce insurance, liability and workers' compensation costs, but the data to back up those claims is difficult to find. The South Wales Police Department in the UK points to internal studies that show measurable savings on department insurance premiums by decreasing damages paid to victims of OITCs.[30] According to the Texas Association of Counties (TAC), the addition of LEDS training in some of the largest counties in Texas reduced auto liability claims by 55% (note that this reduction stemmed from an 18% reduction in the number of collisions involving all county vehicles, not just those driven by LEOs).[31]

From a workers' compensation perspective, payouts to LEOs involved in OITCs can be quite high.[32] Several studies have claimed that LEDS training reduces

30. RoadSafe (2010).
31. FAAC Incorporated.
32. *www.pennprime.com/index.asp?Type=B_BASIC&SEC=%7BF64D3B62-9596-4175-81*

workers' compensation costs, but the concrete data to back up that claim is difficult to find.

Officer Downtime

In one particular example in Pennsylvania, an LEO was on medical leave for more than a year following an OITC.[33] Aside from workers' compensation claims and costs related to paying that LEO, his or her place on the force either had to be filled by others (likely working overtime) or by a new hire. According to the data, the hiring of a new LEO is a lengthy, complicated and costly process.[34]

Another study points to the administrative and investigative costs related to the OITC. Specifically, the South Wales Police Department has seen a 10% reduction in OITCs since implementing LEDS training, and it subsequently calculates a savings of 225 hours of officer downtime related to accident investigation.[35]

Methodology (Data and Statistical Approach)

As noted above, motor vehicle-related accidents have been a significant cost for GMA and ACCG members. While it may be beneficial to society to eliminate all motor vehicle accidents, no organization or economy could afford to expend the unlimited resources that would be necessary to achieve such an outcome. However, it is important for organizations to assess the value of various strategies targeted at mitigating the loss costs associated with aspects of their operations through changing behavior. In this context, it is important for LGRMS and its members to consider the efficacy of motor vehicle simulator training of LEOs in mitigating risk management costs.

LGRMS and its supporting service providers provided data related to automobile accidents involving members' LEOs. Those data were organized and refined to support the statistical analysis that is conducted in this study. All available data from LGRMS was provided for member counties and municipalities in the ACCG and the GMA. These data included the number of LEOs, information on individual accident details and costs, and information on simulator training. These data were available for the period 2000–2015. As described below, the analysis conducted in this study was carried out at the county or municipality level (i.e., the member level).

In assessing loss causation and loss costs, it is common in risk management to focus on three elements: 1) loss frequency, or how many losses occur; 2) loss severity, or how high the loss is when it has occurred; and 3) total loss, which is the

15-A59C23DE0FC9%7D.

33. *www.pennprime.com/index.asp?Type=B_BASIC&SEC=%7BF64D3B62-9596-4175-8115-A59C23DE0FC9%7D*.

34. Hardesty (2014).

35. RoadSafe (2010).

combination of frequency and severity, or how high the financial loss is during a given period, usually a year. In this study, we also focus on these three components.

Frequency Measure

Several measures of frequency could be chosen. The key is to utilize a measure that adjusts for exposure differences between units. Measures of frequency that are adjusted for exposure are often referred to as incident rates. Given the primary focus of this study, we chose to adjust or scale the number of accidents or frequency by the number of LEOs within a law enforcement department. Specifically, we compute the number of accidents incurred by a member department for each year, and then we divide that number by the number of LEOs to calculate the incident rate for that member department for each year. If motor vehicle simulator training conducted by LGRMS is effective in reducing the number of accidents incurred, we should find a negative relationship between the incident rate and the training variable.

Severity Measure

A common measure for severity is the average loss severity. We compute this by dividing the sum of all losses incurred by a member department in each year by the number of accidents incurred in that year. If motor vehicle simulator training conducted by LGRMS is effective in reducing the average severity or magnitude of losses incurred, we should find a negative relationship between the severity measure and the training variable.

Training Measure

From LGRMS, we had data on when simulator training was conducted in a particular city or county. For the purposes of the analysis conducted here, we created an indicator (or dummy) variable that takes the value of 1 if training was conducted for a member (i.e., a city or county law enforcement department) during a given year. A member is coded as 0 if no training was conducted in that year or in any preceding year. Once training was conducted in a member county or city, the variable was coded as 1 in that year and all subsequent years. While some members had additional training sessions conducted in subsequent years, our primary results focus just on "trained" versus "untrained" counties and cities. In our sample period, 48 out of the 159 counties (approximately 30%) had two or more training sessions using the driving simulators. We did not have any situations where training sessions carried over from one year to the next. For most counties that had a second or subsequent training session, that repeated session was conducted more than three or four years after the previous one. In the Robustness and Additional Testing section, we provide the results related to tests of the effect of members repeating training

activities in more than one year during the period of our analysis. As noted below, we find those results to be consistent with our core findings.[36]

Summary Data

To provide some overall sense of the data included in this study, we include here a brief discussion of summary statistics for the key variables included in the analysis based on the ACCG data. The mean incident rate was 0.0863. The median value was 0.0556, suggesting that the distribution of the incident rate was right skewed. The mean incident rate in "trained" member counties was 0.0787, and it was statistically significantly lower than the mean incident rate in "untrained" member counties of 0.0939. While this result does not control for differences across member counties and across time, it does provide some initial indication that training may be effective in reducing accident frequency. The average number of accidents had a mean value of 3.37, and it ranged from a low of zero to a high of 39. Average severity had a mean value of $21,235, and it ranged from a low of $0 to a high of more than $560,000. The number of officers in member counties had a mean value of 55, and it ranged from a low of three to a high of 453. The relative relationships in the summary values for the GMA data are similar to those presented here for the ACCG. However, as noted below, GMA members include a number of smaller departments that did not experience any losses (zero frequency).

Statistical Methodology

Utilizing training and accident loss cost data for ACCG and GMA members, we perform the analysis at the member/county level. We do this separately for the accident frequency and the accident severity. We utilize ordinary least squares (OLS) regression. In this analysis, we control for time and county/city differences while assessing the impact of the variables of interest. This method controls for differences across counties/cities that may influence the incident rate (accident frequency) and the average incident cost (accident severity). We also have included a variable that measures whether the county is urban or rural and whether driver simulator training had been conducted by LGRMS for that county/city. The last variable is the one that provides evidence on whether driving simulator training is affecting motor vehicle accident frequency and severity.

36. While it would be interesting to consider training effects at the individual officer level, the data available from LGRMS did not allow us to link specific training events to individual officers. As noted above, we do provide some additional analysis in the Robustness and Additional Testing section of the paper that does consider the impact of additional training sessions repeated by a member county/city.

Base Specification

Model 1a and Model 1b use dummy variables to indicate whether each law existed for a given member (i) and year (t).

$$FREQ_{it} = \alpha + \beta\, TRAIN_{it} + \gamma URBAN_{it} + \sum_{t=2000}^{2015} \tau_t\, T_t + \sum_{i=1}^{N} \delta_i\, M_i + \varepsilon_{it} \qquad (1a)$$

$$SEV_{it} = \alpha + \beta\, TRAIN_{it} + \gamma URBAN_{it} + \sum_{t=2000}^{2015} \tau_t\, T_t + \sum_{i=1}^{N} \delta_i\, M_i + \varepsilon_{it} \qquad (1b)$$

The variables $FREQ_{it}$ and SEV_{it} represent frequency and severity of loss for member i at time t. $TRAIN_{it}$ represents the training measures discussed above. $URBAN_{it}$ represents the nature of the member county/municipality i's location (urban or rural) at time t. $URBAN_{it}$ takes on the value of 1 in the county/municipality if the percentage of the population living in an urban area, based on U.S. Census Bureau data, is greater than 50%. Of Georgia's 159 counties, 31.4% were defined as urban based on this measure.[37] Time and state fixed effects, T_t and S_i, control for unobserved time trends that affect all states in common and for unobserved characteristics within states that are constant over time, respectively.

The coefficient estimates on the training variable are interpreted as the average effects of the training after it is administered. It tests whether the incident rate or the average severity of loss are lower on average after training is conducted than before. However, this simple test may be biased if the training was conducted in response to changes in accident frequency or severity. If members conducted training because frequency or severity was increasing and the training lowered losses, the estimates underestimate the reduction in accident frequency or severity; i.e., the before and after averages would show little difference. Likewise, if the training was conducted when accident frequency or severity was declining, the bias would be in the opposite direction. To determine whether such a bias is an issue, we test for such trends using a method described in the next section.

Before and After Trends

A common approach to control for this type of endogeneity is to use instrumental variables. Valid instruments must be correlated with the decision to

37. It is also possible that accident rates and severity could vary depending on whether the accident location within a county is urban or rural. We are unable to evaluate this issue given the current nature of our data.

conduct training but uncorrelated with the variable of interest (incident rate or average severity). Identifying a suitable instrument can be difficult. Therefore, we use an alternative method that controls for before and after time trends for the training variable, as shown in Model 2a and Model 2b.

$$FREQ_{it} = \alpha + \beta\, TRAINBEFORE_{it} + \gamma\, TRAINAFTER_{it} + \eta URBAN_{it} + \sum_{t=2000}^{2015} \tau_t T_t + \sum_{i=1}^{N} \delta_i M_i + \varepsilon_{it} \qquad (2a)$$

$$SEV_{it} = \alpha + \beta\, TRAINBEFORE_{it} + \gamma\, TRAINAFTER_{it} + \eta URBAN_{it} + \sum_{t=2000}^{2015} \tau_t T_t + \sum_{i=1}^{N} \delta_i M_i + \varepsilon_{it} \qquad (2b)$$

By using this estimation technique, we follow a growing literature that uses before and after time trends to control for the potential bias described above.[38] Once we estimate these trends, we can test whether the differences in the before and after trends are statistically significant. This approach has two important advantages. First, the coefficient estimates are easy to interpret; i.e., positive coefficient estimates on the before and after trends indicate that accident frequency or severity was increasing before and after the laws were enacted. Second, it does not shorten the sample, as would the use of a series of leads and lags. Table 1 depicts the differences in the two estimation strategies. We present the results of the before and after trends analysis in the Robustness and Additional Testing section.

Results and Empirical Findings

We carried out the analysis described above by estimating separate regression models for the ACCG for both incident rate and average severity. We also estimated separate regression models for the GMA for both incident rate and average severity. We report on the relationship between driver simulator training and those outcomes. We then provide estimates of the fiscal impact of those findings in terms of any reduction in total loss costs per annum. Finally, we report briefly on some additional analysis that we conducted that provides further evidence on the reliability of our findings.

38. Table 1 allows comparison of the *TRAIN* variables in model 1 to the *TRAINBEFORE* and *TRAINAFTER* variables in model 2. Others who have used this empirical technique to evaluate the impact of laws are Grinols and Mustard (2006); Hoyt et al. (2006); Lott, Jr. (1998); Mustard (2001); and Plassman and Whitley (2003).

Table 1:
Comparison of Training Variables

Year	*TRAIN* (Model 1a,1b)	*TRAINBEFORE* (Model 2a,2b)	*TRAINAFTER* (Model 2a,2b)
2000	0	-6	0
2001	0	-5	0
2002	0	-4	0
2003	0	-3	0
2004	0	-2	0
2005	0	-1	0
2006	1	0	0
2007	1	0	1
2008	1	0	2
2009	1	0	3
2010	1	0	4
2011	1	0	5
2012	1	0	6
2013	1	0	7
2014	1	0	8
2015	1	0	9

Represents the three variables for training administered in 2006.

First, estimating Model 1a (described above) resulted in the following empirical results for accident frequency when applied to the data available from ACCG members. As illustrated in Table 2, while controlling for the variables mentioned above, we find evidence of a statistically significant reduction in accident frequency associated with driver simulator training. This result is highly statistically significant (significant at less than the .01 level). The results for the urban indicator control variable were negative and statistically significant which, logically, suggests a lower accident frequency in urban counties.

Estimating Model 1b (described above) resulted in the following empirical results for accident severity when applied to the data available from ACCG members. As illustrated in Table 3, while controlling for the variables mentioned above, we find a negative coefficient on the training variable, but this result on the relationship between driving simulator training and accident severity is not statistically significant. For the severity data, the coefficient on the urban indicator control variable is positive and statistically significant, which suggests higher accident severities in urban counties.

Table 2:
Frequency Regression Results (ACCG)

Dependent variable: number of accidents incurred divided by the number of officers (incident rate)		
Variable	**Estimate**	***t-value***
Intercept	-6.8843	-4.8536**
Trained	-0.0293	-4.6333**
Urban	-0.0180	-2.6548**
Member Fixed Effects	Yes	
Year Fixed Effects	Yes	
R^2 (%)	2.75	
Observations	1,463	

+ indicates statistical significance at the 10% level
* indicates statistical significance at the 5% level
** indicates statistical significance at the 1% level

Table 3:
Severity Regression Results (ACCG)

Dependent variable: sum of all losses incurred divided by the number of accidents incurred (average severity)		
Variable	**Estimate**	***t-value***
Intercept	-1411753.559	-2.0547*
Trained	-2088.283	-0.7042
Urban	23717.048	7.8534**
Member Fixed Effects	Yes	
Year Fixed Effects	Yes	
R^2 (%)	6.78	
Observations	1,159	

+ indicates statistical significance at the 10% level
* indicates statistical significance at the 5% level
** indicates statistical significance at the 1% level

Based on these model results for ACCG members' data, we have estimated the fiscal impact of these findings. These results translate into a reduction in total accident costs per year of approximately $2.3 million for member counties that have used training offered by LGRMS. Specifically, as reported in Table 2, the coefficient on the training variable that was estimated in the ACCG data was -0.0293. This means that training resulted in a reduction in loss frequency per officer of 0.0293 per annum. Based on the average claims severity of $17,000, the estimated reduction in costs per officer is $498.40 (.0293 x $17,000). Based on the total of

4,724 officers in counties that had training, the total fiscal impact was $2,354,426.46 (.0293 x $17,000 x 4,724).

Additionally, our analysis suggests that if training was utilized in member counties that have not yet been trained, this would result in a roughly $600,000 reduction in total accident costs per year in those member counties. With 1,251 officers in counties with no training, the same calculations result in a total estimated fiscal impact of $623,494.39 (.0293 x $17,000 x 1,251). These results also translate into a total reduction in accidents per year of 175 ([4,724+1,251] x .0293).

Second, estimating Model 1a (described above) resulted in the following empirical results for accident frequency when applied to the data available from GMA members. As illustrated in Table 4, while controlling for the variables mentioned above, we also find evidence of a statistically significant reduction in accident frequency associated with driving simulator training. This result is statistically significant (significant at less than the .05 level). Because GMA members are towns and cities, and due to some coding difficulties, we did not include the urban/rural indicator control variable in the models applied to the GMA data. It should be noted here that we removed observations from a number of smaller departments that did not experience any losses (zero frequency). For comparison, we also re-estimated the results provided in Table 2 and Table 3 while omitting the urban/rural indicator variable. In those cases, the sign on the training variable remains negative and statistically significant, consistent with the results in Table 4 and Table 5 for the GMA data.

Table 4:
Frequency Regression Results (GMA)

Dependent variable: number of accidents incurred divided by the number of officers (incident rate)		
Variable	**Estimate**	***t-value***
Intercept	1.0792	0.2506
Trained	-0.0445	-2.1222*
Member Fixed Effects	Yes	
Year Fixed Effects	Yes	
R^2 (%)	.36	
Observations	1,993	

+ indicates statistical significance at the 10% level
* indicates statistical significance at the 5% level
** indicates statistical significance at the 1% level

Estimating Model 1b (described above) resulted in the following empirical results for accident severity when applied to the data available from GMA members. As illustrated in Table 5, while controlling for the variables mentioned above, we find that the coefficient on the training variable indicates a reduction of roughly

$4,000 in average severity and, unlike the results for the ACCG data, this result was statistically significant at the .05 level.

Table 5:
Severity Regression Results (GMA)

Dependent variable: sum of all losses incurred divided by the number of accidents incurred (average severity)		
Variable	**Estimate**	***t-value***
Intercept	-1641665.846	-3.7857**
Trained	-4247.844	-2.0122*
Member Fixed Effects	Yes	
Year Fixed Effects	Yes	
R^2 (%)	.81	
Observations	1,994	

+ indicates statistical significance at the 10% level
* indicates statistical significance at the 5% level
** indicates statistical significance at the 1% level

Based on these model results, we have estimated the fiscal impact of these findings. These results translate into a reduction in total accident costs per year of approximately $1.3 million for member municipalities that have utilized training offered by LGRMS (the estimated number was $1,373,217.82). A similar approach and calculations to those reported above for the ACCG data was used in the case of the GMA data. The coefficient on the training variable that was estimated in the GMA data was -0.0445 as reported in Table 4. The average claims severity was $13,127, and the number of LEOs in units included in our analysis was 2,351 in trained municipalities and 1,220 in untrained municipalities. While the training variable was statistically significant in the severity data of GMA (unlike the case of the ACCG data), to error on the side of conservatism, we did not include a reduction in the average severity when making our calculations of the estimated savings in accident costs. Additionally, our analysis suggests that if training was utilized by member counties that have not yet been trained, this would result in a roughly $700,000 reduction in total accident costs per year in those member municipalities (the estimated number was $712,601.34). These results also translate into a reduction per officer in loss costs per year of $584 and a total reduction in accidents per year of 158.

Combining the cost reductions estimated above, the total fiscal impact for members that have utilized training is approximately $3.6 million per annum, and the total potential fiscal impact for members that have not yet utilized training is an additional $1.3 million per annum. The aggregate fiscal impact for ACCG and GMA members included in our analysis would be $4.9 million per annum. It should be noted here that in order to provide a conservative estimate of cost savings, we do not currently incorporate any allowance for our finding in the GMA data of a

statistically significant impact in reducing the average loss severity. We do this because we did not find evidence of a statistically significant reduction in the average loss severity in the ACCG data. Finally, it should also be noted that due to missing data, some members were not included in the analysis presented here. If the reduced loss costs associated with driving simulator training that we estimate here could be realized by these other member counties and municipalities, this would lead to even greater total cost reductions.

Robustness and Additional Testing

A potential concern with the indicator variable approach that we used above is that the choice by a county or city to carry out simulator training may be motivated by higher losses that are being experienced by that member. As discussed above, this type of phenomenon in a statistical sense is referred to as selection bias or endogeneity. If average potential outcomes are not independent of the treatment (in this case, simulator training), then the average treatment effect is not equal to the difference in observed means (which is what we are measuring with the dummy variable approach in our base model). To test for this, we use a method that includes before- and after-trend variables for the training decision (this approach was presented above as Model 2a and Model 2b). If increased losses are leading to the decision to offer training, we would expect the sign on the before-trend variable to be positive and statistically significant. If the training is reducing losses, we would expect the difference between the before- and after-trend variables to be negative and statistically significant. The results of this estimation for incident rate on ACCG data are presented in Table 6.

Table 6:
Before- and After-Trend Variable – Frequency Regression Results (ACCG)

Variable	Estimate	*t-value*	*F-Value*
Intercept	-7.0930	-3.9454**	
Trained Before	0.0023	1.4401	5.432** negative
Trained After	-0.0051	-4.6083**	
Urban	-0.0185	-2.7382**	
Member	0.0001	1.2452	
Year	0.0035	3.9983**	
R^2 (%)	2.90		
Observations	1,463		

+ indicates statistical significance at the 10% level
* indicates statistical significance at the 5% level
** indicates statistical significance at the 1% level

In this additional analysis, we find that the sign on the before-trend variable is indeed positive, but not statistically significant. However, the difference between the before- and after-trend variables is negative and highly statistically significant. This result is consistent with our core results presented above, and it suggests that endogeneity is not influencing our results. Analysis for the other average severity and for GMA data also do not suggest any evidence of bias.

The likely impact of the endogeneity of treatments under different assumptions is discussed by Guryan (2004). Ashenfelter and Card (1985) use a lagged dependent variable as an additional explanatory variable as one approach to controlling for the possible endogeneity of treatments. Following this approach, we re-estimate the base model, including the lagged value of the dependent variable (incident and average severity) as an additional independent variable, and the results are consistent with those found in the base model. Specifically, while the coefficient on the lagged variable is positive and highly statistically significant, the training variable in the incident rate model remains statistically significant at the .01 level, negatively signed, and of similar magnitude. These results, as well as those from the before- and after-trend variable approach above, suggest that endogeneity is not influencing our results.

Also, as mentioned above, some members repeated training sessions in more than one year during the period of our analysis. To assess the potential impact of repeated training sessions, we also estimated the models with indicator variables for members that had two or three training periods. In these models, the two indicator variables were not statistically significant, but the indicator variable for at least one training session remained negative and statistically significant, which is consistent with our core results presented above. It is still possible that repeated training sessions would be valuable if we could measure the training effect at the individual LEO level. However, as noted above, data limitations prevented us from linking the training sessions with individual LEOs.

LGRMS Driver Simulator Training Costs

Based on 2016 information, LGRMS estimates the operating costs associated with training using its current simulators to be as presented in Table 7. As noted in Table 6, simulator training costs are $403,500 per year. Based on the analysis conducted in this study, the magnitude of these findings suggests a positive ROI of more than 12:1 for LGRMS' driver simulator training. It is important to note here that these estimates are based only on automobile liability and property damage loss data. As observed in our review of the prior literature, and by LGRMS' own experience, motor vehicle accidents involving LEOs also result in substantial workers' compensation-related costs to counties and municipalities, and these are not captured in our analysis. Inclusion of these costs would result in a further increase of the ROI estimated in our study. Additionally, several noneconomic impacts are not considered in our analysis.

Table 7:
LGRMS Simulator Training Costs

Current system cost:

Ford F250 Truck	$ 35,000
Trailer	$ 50,000
Doran Simulator	$100,000
Total	$185,000

Annual operating expense estimates:

Depreciation of truck, trailer, simulator over 10 years	$ 18,500
Maintenance	$ 10,000
PSRC Salary	$ 55,000
PSRC Benefits	$ 31,000
Travel	$ 20,000
Annual Expense for Each PSRC	$134,500
Annual Expense for Total PSRC	$403,500

Conclusions and Opportunities for Additional Research

LGRMS indicates that its No. 1 loss within law enforcement continues to be related to motor vehicle incidents. In order to reduce the risk of these incidents from occurring in the future, LGRMS provides simulator training for its members. As documented by our review of the literature, a question that has remained largely unanswered by prior studies is the efficacy of this sort of training in mitigating risk management costs.

Based on data supplied by LGRMS, we conducted research related to the efficacy of motor vehicle simulator training of LEOs in mitigating risk management costs. A key question that we sought to address in this study is whether any reduction in motor vehicle accident frequency and/or severity associated with the motor vehicle simulator training provided by LGRMS to its members offsets the costs of providing this training. LGRMS not only provides motor vehicle simulator training to its members, but it also oversees the loss cost data for motor vehicle accidents involving LEOs employed by its members. As a result, LGRMS was in a unique position to facilitate the analysis conducted in this study.

Based on our analysis, we estimate that the current annual investment LGRMS makes in providing motor vehicle simulator training is producing a ROI to its members of roughly 12:1 (i.e., loss cost reductions 12 times larger than the annual motor vehicle simulator training costs). We believe that our analysis provides strong evidence relative to the efficacy of motor vehicle simulator training of LEOs in mitigating risk management costs through changing behavior.

Recommendations and Findings Based on Our Review of Prior Studies

Based on existing research and the findings of our study, it seems appropriate to include the following recommendations to any law enforcement department considering LEDS training.

1. Do not abandon or replace traditional classroom and/or EVOC training. The most effective way to reduce OITCs is by integrating LEDS training into an already established training program consisting of classroom and/or EVOC training.
2. Ensure that LEDS training software is realistic and not "game-like." The images, streets, driving conditions, traffic patterns, and presence of pedestrians should be as close to reality as possible.
3. Similar to the second recommendation, spend time and money to ensure that the physical LEDS structure is as realistic as possible. Include actual seats, steering wheels, buttons, pedals, etc. Ensure that the physical layout of the simulator is exactly the same as what LEOs can expect to see in actual vehicles. If possible, include gyroscopic technology that will allow for movement of the simulator and haptic feedback.
4. Allow LEO trainees to fail. As mentioned, the best lessons come from failures. A key learning point in simulator training is the "worst-case scenario." Allow LEOs to experience those scenarios in the simulator so they can better cope with a similar experience in the real world.

To the best of our knowledge, it appears that, to a large extent, the simulator training being offered by LGRMS is incorporating these best practices. In fact, it is likely that these very elements are contributing to the beneficial impacts that we find in our analysis of the ACCG and GMA loss data.

Implications for Public Policy and Future Research

The recent concern over increasing motor vehicle loss frequency and severity in most states means that our research has important implications for state legislative and regulatory authorities as they seek ways to mitigate growing motor vehicle loss costs. In addition to the oversight responsibilities that state insurance regulators and legislators have relative to motor vehicle accident costs and related impacts on insurance costs, these public policy makers also oversee motor vehicle licensing and associated training requirements for motor vehicle operators in their states. Cost-effective training strategies are not only important for motor vehicle loss mitigation associated with LEOs in their states, but for commercial and private passenger motor vehicle operators, as well. In addition to the benefits we document for the use of motor vehicle simulator training of LEOs, our results suggest that efforts by state insurance regulators and legislators to facilitate and encourage motor vehicle

simulator use as part of their state's licensing and insurance requirements would provide important benefits to the public in their state.

Given our overall finding that motor vehicle simulator training is related to a reduction in loss frequency, further research targeted at identifying the specific aspects of training programs that contribute to this reduction would be warranted. Such research could improve the quality and effectiveness of simulator and other motor vehicle training programs. Also, LGRMS and related organizations in other states could provide the necessary data and experience to facilitate an expansion of the focus of this current study.

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When Insurers Have Discretion: Lessons for Regulators from UK Insurers' Response to the Global Financial Crisis

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Abstract

This paper examines the steps taken by life insurers writing participating business in the UK to protect their solvency during the global financial crisis of 2008. It highlights two areas where the insurers had discretion and the interest that regulators have in controlling that discretion. The first is that the regulations then in force allowed discretion to insurers in the discount rate they used to calculate their liabilities in the calculations of solvency that were required. This paper finds that one of the main responses of the insurers to the global financial crisis was to reduce the margin of prudence in the discount rate they used to value their liabilities, meaning that their liabilities were given a lower value than otherwise, with a consequent increase in their reported solvency. Insurers also used their discretion to increase their charges to and reduce the payouts to policyholders, while they also reduced risks by adopting a more conservative investment strategy. This paper then considers the effect of Solvency II regulation introduced in the European Union (EU) in 2016 and the implications for regulators generally. Regulators need to be wary of rules that offer insurers discretion in calculating their liabilities; they may use it to enhance their reported financial position in a way that is essentially artificial. Solvency II removes the discretion in choice of discount rate, implying that insurers need to review how they manage solvency in adverse circumstances. It is also suggested that European regulators review their rules to ensure that policyholders are fairly protected when insurers have discretion on charges and payouts.

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Introduction

European Union (EU) insurers have, from 2016, been subject to the Solvency II regime, its design having taken account of the global financial crisis of 2008. EU insurers had largely survived the crisis. However, they had to overcome problems as their assets (at market value) took a hit from the decline in prices of shares, corporate bonds and real estate, while the value of their guaranteed benefits increased as they were valued by discounting at market rates of interest, which fell rapidly.

The aims of this paper are to: 1) ascertain the response to the global financial crisis of one set of insurers—UK life insurers writing participating business—which enabled them to survive the rigors of the markets in 2008; 2) suggest how, in the new era of insurance regulation introduced by Solvency II in 2016 (Braun & Weber, 2017), insurers and regulators may need to manage their responsibilities differently; and 3) highlight the implications of regulations that allow discretion to insurers.

One particular focus has implications for regulation in general. In Solvency I, the regime that preceded Solvency II, insurers exercised discretion in choosing a margin for prudence when determining the interest rate to value their liabilities. In the difficult financial circumstances of 2008, they might reduce that margin, producing a lower reported level of liabilities than otherwise and a reported level of solvency that was higher. However, such changes in the figures reported would not be true representations of the underlying financial position. To the extent that this was the case, it implies that regulators need to monitor insurers who can use discretion in valuing their liabilities. That discretion in choice of interest rate has been removed in Solvency II but may still be available in other aspects of valuations and in other jurisdictions.

Another issue relating to insurers' discretion is their ability to change the charges on and payouts to policyholders. Insurers' conduct in these areas, especially when they face difficult financial conditions, is a matter of interest to regulators.

After setting out the background to participating business and its regulation, this paper reviews the literature on the approaches a life insurer in a weak financial position can take to preserve the solvency figures that it reports. These approaches fall into five categories. First are techniques to improve the reported, rather than the underlying, financial position of the insurer. They might be regarded as cosmetic changes that enable a firm to meet regulatory requirements on capital but do not provide a genuine representation of its ability to meet its obligations under various scenarios. Secondly, an insurer can share the burden of adverse conditions with policyholders. Thirdly, it can move to a less risky investment strategy to avoid further deterioration in its solvency. The fourth possibility is that insurers increase their reinsurance, again protecting them against a further worsening of solvency. Lastly, they can reduce the impact on their solvency of the new business they write.

The literature on how insurers can protect their solvency in adverse conditions is largely from (theoretical) actuarial papers, and a contribution of this paper is to establish which management actions were important in practice in the global

financial crisis. This is done with data covering the period 1999—2010 so that the context of the crisis can be properly understood.

However, following the changes introduced by Solvency II, the techniques to protect solvency used in 2008 may not be suitable in the future. This paper, therefore, considers the insurers' management actions found to be prominent in 2008, namely reducing the prudence in the discount rate chosen to value their liabilities, increasing charges to and reducing the payouts to policyholders, and moving to a less risky investment strategy. This paper also assesses the implications now that Solvency II is in operation. In particular, insurers and regulators need to recognize that the insurers' discretion over the discount rate to value their liabilities has been largely removed, while the European Insurance and Occupational Pensions Authority (EIOPA) may need to place greater emphasis on those regulations intended to ensure that insurers' actions, which affect policyholders, are consistent with their obligation to treat policyholders properly ("conduct regulation").

This paper continues by explaining participating life business in the UK and its regulation, followed by a review of the literature to ascertain how insurers can protect their solvency in adverse conditions. Subsequent sections set out the hypotheses being tested and the methodology described, the data used and the findings. Next is an assessment of whether these actions can apply in Solvency II and the implications for insurers and regulators. A final section concludes.

The Operation of Participating Life Business in the UK

The study covers the UK life insurance industry which, in 2007, was the second largest in the world, measured by premiums (Swiss Re, 2008). Participating business represented a significant part of the UK life insurance business, with £286 billion liabilities at the end of 2007.[1] The policies provide guaranteed payments to policyholders, who also expect to receive a share of the profits that are earned (from insurers declaring "bonuses"). However, insurers were taking significant risks by, typically, investing a substantial part of their assets in equities and real estate, notwithstanding the substantial guarantees they were providing. This, therefore, gives rise to a significant challenge in risk management. At the end of 2007, 39% of their asset exposure was to equities, 11% to real estate and 39% to bonds. This contrasted with the strategy of life insurers in many other countries, where investment was more focussed on bonds (OECD, 2011).

The insurers faced a major challenge to their solvency from the global financial crisis. First, the market value of their assets fell markedly. The Financial Times Stock Exchange (FTSE) 100 Index dropped by 31% from 6457 at the end of 2007 to 4434 by the end of 2008. It fell further to 3461 on March 9, 2009. The Investment

1. The industry data used are, unless stated otherwise, from the SynThesys Life database of Standard & Poor's, which covers all UK-authorized life insurers.

Property Databank (IPD) UK annual property index, based on the real estate portfolios of institutional investors, showed a fall of 26.3% in 2008. Corporate bond spreads widened. For example, one major life insurer (Legal and General) reported the yield on its BBB-rated securities as 1.86 percentage points above UK government bonds at the end of 2007 but 5.2 above at the end of 2008.[2] Second, the value of insurers' liabilities increased. This was the result of a sharp decline in yields on UK government bonds in the second half of 2008, from 5.18% at the end of June to 3.74% at the end of the year (15-year bonds). Those yields were used as the basis for discounting insurers' liabilities for guaranteed benefits, which were, therefore, revalued upwards. Nevertheless, all these insurers met regulatory capital requirements at the end of 2007, 2008 and 2009.

These problems were not new. At the end of 1999, the FTSE 100 Index reached 6930. The bursting of the dot-com bubble was the start of the 53% decline in the index to 3277 on March 12, 2003. Yields on 15-year UK government bonds fell from 5.15% at the end of 1999 to 4.35% in February 2003. As a result, it will be useful to examine recent trends in order to put the 2008 crisis in context.

Summary figures for life insurers' solvency are shown in Table 1, which covers the whole of the participating business market, using data at insurers' financial year-ends, usually Dec. 31. At the end of 1999, participating insurers' average solvency ratio was 16.41% (i.e., assets were 16.41% more than liabilities). By 2002, this was only 4.40%. There was an improvement thereafter and by 2006, the average ratio was up to 9.04%. However, it fell to 5.09% in 2008. (Ratios are weighted unless stated otherwise.)

Table 1:
Summary Data

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
No. of insurers	122	118	109	110	107	99	89	84	79	77	71	68
Admissible assets (£bn)	674.1	688.2	654.2	604.2	641.3	668	784.4	753.1	783.1	665	694	735.8
Policy liabilities (£bn)	521.2	563.7	567.3	550.9	569.5	585.3	666.3	615	641.3	560.5	584.7	608.9
- including participating business (£bn)	313.0	345.2	350.7	338.3	333.2	329.7	327.4	303.9	286	268.3	256	250.6
Solvency ratio	16.41%	10.15%	6.49%	4.40%	5.91%	5.71%	6.42%	9.04%	7.66%	5.09%	6.19%	6.46%

Policy liabilities = Liabilities valued in accordance with Solvency I rules and net of reinsurance, excluding expected distributions of surplus from funds closed to new business.
Solvency ratio = Admissible assets divided by liabilities, minus 1, in accordance with Solvency I rules.

Some further explanation of participating policies will be useful. Many of these are endowment policies, the description of which illustrates the issues involved. These policies guarantee policyholders a minimum sum insured, payable on the earlier of death or reaching the maturity date, often 25 years after the policy commenced. The guaranteed sum is calculated assuming a very modest investment return, hence with an expectation that the fund will earn significant profits. At the

2. Data from Legal and General's regulatory returns to the Financial Services Authority.

annual valuation of the assets and liabilities of the fund, some of the surplus is distributed as an "annual bonus." An insurer may declare a bonus rate of, for example, 2%, meaning that the guaranteed sum insured is increased by 2%. Hence, if the policyholder survives to maturity, as is usually the case, the guaranteed sum insured is then substantially more than was guaranteed at the outset. However, the insurer then checks that the policyholder receives a fair return for the premiums paid and calculates the notional share of the assets in the fund attributable to the policy ("asset share"), being the premiums paid on the policy, together with the return on the investments, minus expenses and the cost of claims. The insurer can then add a "terminal bonus" to the guaranteed benefits so that the maturity value is about equal to the asset share. If the policyholder dies before the maturity date, the insurer will add a terminal bonus to the guaranteed benefits in order to reflect the investment return, etc., on the assets underlying the policy in the years the contract has been in force. Some participating policies are designed to pay a pension, the maturity date being chosen to coincide with retirement, and the sum then payable is used to buy an annuity. Participating policies amounted to 22% of the liabilities of UK life insurers in 2008.

The problem for an insurer is that if the assets have declined in value, the asset share may be lower than the guaranteed benefits, in which case it needs to use its capital to ensure that its obligation to policyholders is fulfilled.

A particular feature of this business is "smoothing." This means that while, in principle, terminal bonuses could change frequently so that maturity values reflect asset shares accurately, terminal bonuses were, in practice, usually changed only once a year, and the changes were moderated or "smoothed." In the 1990s, insurers' practice, although it was not a contractual requirement, was to limit the percentage change in the maturity value on policies from year to year to a figure such as 10% (Harley and Davies, 2001).[3] A number of actuarial papers also assumed this to be the case in their modelling (Eastwood et al., 1994; Nowell et al., 1999).

Most of the business is done by stock insurers, with profits being divided between policyholders (typically 90%) and shareholders (10%). In mutual insurers, all distributed profits are available for policyholders, although there is no shareholder capital to fall back on. The insurers usually write some non-participating policies as well.

Regulation

The industry was regulated by the Financial Services Authority (FSA), which was replaced in 2013 by the Prudential Regulation Authority (PRA). The FSA monitored solvency by checking that the excess of an insurer's assets over liabilities

3. For example, the payout on a 25-year endowment assurance policy with a premium of £50 per month for a 30-year-old and maturing in 1999 would not be more than 10% more or less than on such a policy maturing in 1998.

was at least equal to the minimum capital requirement using Solvency I rules, which depends on the value of an insurer's liabilities and the death benefits it provides; there was a reduction where benefits are reinsured. This monitoring uses the traditional valuation that insurers carried out. Assets are largely at market value, although certain assets are excluded (inadmissible assets). Liabilities are calculated using prudent actuarial assumptions based on market interest rates.

The challenges of financial conditions in 2000–2003 led the industry to press for a new approach to the valuation of insurers' assets and liabilities, and the FSA also favored change, looking for a more transparent way to measure insurers' solvency. It introduced, from 2004, new requirements for insurers that had more than £500 million of liabilities on participating business. They were required to prepare a "realistic balance sheet" and are termed "realistic reporters." They accounted for the vast majority of this business, with 89% of participating insurers' assets in 2008. The main points follow, taken from the FSA's rule book. Assets were at market value and included items previously inadmissible. Policy liabilities were the sum of asset shares, plus the value of additional payments expected as a result of guarantees or options or because of smoothing. The discount rate was consistent with market interest rates, without discretion. Indeed, all calculations were to be on a market-consistent basis. Tax and other miscellaneous liabilities were added in. Deductions were allowed for charges that insurers made for guarantees, options and smoothing. Realistic reporters were required to have a minimum level of capital that enabled them to pass specified stress tests—for example, if share prices fell by 20% or interest rates changed by 17.5%. In addition to this new approach, realistic reporters still had to carry out the traditional valuation and meet capital requirements under the Solvency I rules. Insurers issued "regulatory returns" that reported their financial position.

The way in which the valuation is market-based meant that the insurers were exposed when the global financial crisis struck. As Schich (2009) commented, values of equities and corporate bonds declined almost simultaneously, while the decline in government bond yields meant that there was a substantial increase in liability levels.

Literature Review

The approaches that management can use to protect solvency are in five categories: 1) implementing changes to improve the reported, rather than the underlying, financial position of the insurer; 2) sharing the burden of adverse conditions with policyholders; 3) moving to a less risky investment strategy; 4) increasing reinsurance; and 5) reducing the impact of new business being written. Tuley (2009) indicates that an insurer's financial position is a key factor in deciding what action to take. It is reasonable to suppose that, at times of crisis, these actions will have become especially significant.

Implementing Changes to Improve the Insurer's Reported Financial Position

The first approach is to improve the reported financial position through "cosmetic changes" that do not truly improve the ability of the insurer to meet its obligations. This covers two possibilities.

First, in the traditional valuation of liabilities, the regulations require an insurer to use "prudent" assumptions, but the extent of that prudence can be reduced, leading to a lower value of liabilities and higher reported solvency than otherwise. Bunch (1988, p. 78) described this "evidently a useful short-term expedient." In particular, an insurer can choose to increase the rate at which it discounts future claims, subject to a maximum specified in the regulations, based on government bond yields. As the chief executive of the UK's Financial Reporting Council (FRC) said, "Discounting is like a magic financial telescope - designed to be looked through the fat end. The purpose of a normal telescope is to make small things in the distance appear larger. The magic discounting telescope has the opposite effect by making large things in the distance appear smaller" (Boyle, 2009). He went on to highlight the power of the magic telescope as enabling the choice of a higher discount rate to reduce the reported present value. Indeed, it has been found that pension funds that are financially weak tend to use a higher discount rate than funds that are strong (Asthana, 1999). Similarly, insurers may reduce the prudence margin in the discount rate they use. Second, an insurer can sell inadmissible assets, and then buy assets that are admissible. For example, inadmissible assets may be sold to a non-insurance company in the group to which insurance regulations do not apply (Kerr and Rogers, 1990). However, FSA rules from 2005 led to realistic reporters (who accounted for most of the business) being able to include assets previously inadmissible, so that this may not be material for actions in 2008.

Sharing the Burden of Adverse Conditions with Policyholders

The second approach is to share some of the burden with policyholders when a financial crisis reduces an insurer's surplus assets. In particular, as the profits in which they are participating are lower, rates of bonus are expected to reduce (Bunch, 1988; Hare et al., 2004). Insurers would reduce the rate of annual bonus to limit the build-up of guaranteed benefits, while terminal bonus rates would be reduced so that maturity values reflect lower asset values. In a crisis, insurers may reduce maturity values by changing the smoothing they do (Dullaway and Needleman, 2004), enabling them to reduce bonus rates more quickly and deeply than otherwise. Harley and Davies (2001, p. 41) said, "If faced with insolvency they would have the option of changing the (smoothing) rules and making more abrupt changes; indeed it would be very odd if companies clung to rules that threatened them with imminent ruin."

Insurers can also reduce the amount they pay when policyholders surrender their policies. Additionally, insurers can increase the charges they make for guarantees, options and smoothing (Dullaway and Needleman, 2004). A survey in

2000 found that only eight out of 33 insurers made such charges, although several others intended to start doing so (Tillinghast-Towers Perrin, 2001).

However, insurers cannot be unfair in their treatment of policyholders in order to protect solvency. They also need to balance the interests of current and future claimants, while there are also some difficult issues in ensuring that shareholders' interests are not favored over those of policyholders (O'Brien, 2012).

Moving to a Less Risky Investment Strategy

The third approach is to reduce the risk of further declines in solvency by changing investment strategy. In principle, asset-liability management in a way that protects an insurer from the effect of changes in financial markets implies that it would have sufficient investments in bonds to match its guaranteed liabilities, with equities and real estate only bought from surplus funds. Traditionally, though, insurers have used their often substantial surplus of assets over guaranteed liabilities to justify taking investment risks, holding more equities and real estate and fewer bonds than matching implies (Elliott, 1988). As solvency declines, it is less easy to justify this "mismatching," and insurers are, therefore, expected to reduce their equity and real estate holdings and increase bond holdings (Nowell et al., 1999; Hare et al., 2004; Tuley, 2009). Such a reduction in risks is consistent with the finite risk theory of risk management as referred to by Baranoff and Sager (2011). They propose that firms plan a given level of risk and if, for example, asset values reduce, exposing firms to greater risk, they will reduce risks elsewhere to compensate. A number of studies of U.S. life insurers by Baranoff and Sager (2002, 2009, 2011) found mixed evidence, with increased financial risks not always being fully compensated for by actions elsewhere to reduce risk.

On the other hand, there could be an incentive for a weak firm to take greater risks (in investment strategy, for example). If they do not succeed, the firm can increase shareholder value by exercising the put option to default, not meeting all its liabilities because its assets are insufficient (the excessive risk theory: Baranoff & Sager, 2011). Meanwhile, statutory guarantee funds ensure policyholders' claims are paid. However, UK regulators were taking an increased interest in insurers' risk management, finding improvements over time (FSA, 2003, 2006), so UK life insurers looking to take extra risks to rescue them from adverse financial conditions would face difficulties from regulators.

Increasing Reinsurance

A fourth possibility is to buy more reinsurance to reduce risk. Adams, Hardwick and Zou (2008), in a panel data analysis of UK life insurers, found that a lower solvency ratio was associated with greater use of reinsurance. Indeed, some reinsurance products were specifically designed to assist weak insurers whose financial position appeared especially poor when measured using the (prudent) traditional valuation. When realistic reporting was introduced in 2004, the rationale

for such products (intended to counteract "unrealistic" rules) fell away, and some deals were terminated. An example was a large reinsurance between Sun Alliance and London Insurance Company and a combination of three reinsurers, originally effected in 2000.

Reducing the Impact of New Business Being Written

The final set of actions addresses the problem that writing new business depletes surplus ("new business strain": Bunch, 1988). This is because when a premium of X is received on a new policy, the assets increase by less than this because of acquisition costs, while the liabilities may increase by more than X because they are calculated on a prudent basis (in the traditional valuation). The realistic reporting regime helped insurers avoid the negative impact of new business on their balance sheet if it was expected to be profitable, although high acquisition costs were still an issue. To reduce new business strain an insurer can:

- **Write less new business** (Bunch, 1988). Indeed, a fund could cease writing new business, becoming a "closed fund" (Hairs et al., 1999). This is more likely if an insurer's solvency level is low (O'Brien and Diacon, 2005).
- **Write a higher proportion of its new business using products that produce low new business strain.** Such "low strain products" can be regarded as policies where only a single premium is paid, or if written on a "unitized" basis, where the guarantees relate only to benefits secured by premiums that have been paid (O'Neill and Froggatt, 1993), as distinct from the "conventional" basis, where guarantees relate to all premiums over the policy term.
- **Reduce acquisition costs.** Siglienti (2000) suggested that insurers cut costs in response to financial weakness resulting from lower interest rates. There were also other incentives for this, such as the introduction in 2001 of "stakeholder pensions," where insurers' charges were limited to 1% p.a. of the fund (from 2005, the charge in the first 10 years could be 1.5%). Such charges were well below what insurers were previously charging, adding to the pressure to reduce costs—in particular, commission to agents.

Hypotheses and Methodology

The hypotheses in this study are that, in 2008, insurers:

- Reduced the prudence margin in the discount rate.
- Reduced maturity and surrender values and increased charges.
- Increased the proportion of assets in bonds with reductions for equities and real estate.
- Increased reinsurance.

- Reduced the amount of new business, increased the proportion represented by low strain products and reduced acquisition costs.
- Possibly, reduced their inadmissible assets.

The methodology is to examine indicators of management actions, such as the prudence margin in the discount rate in 2007 and 2008, and use paired t-tests to compare the indicators in those two years.

Having established what management actions were used to a significant degree in 2008, we supplement the findings by determining how many insurers used all or most of those actions.

It is useful to examine the indicators over a longer period, namely 1999–2010. We identify certain years as "bad" in economic terms, where interest rates and share prices both fell (2000, 2002, 2008), and those years that were "good" (interest rates and share prices both increased: 2003, 2006, 2009). We then use paired t-tests to assess whether the hypotheses tested for 2008 are also valid for the other "bad" years and whether the reverse is true for the "good" years (i.e., an increase in the prudence margin, etc.). However, there was a strong trend to reduce maturity values over the period, which we will study more fully later. Therefore, it is appropriate to use the change in maturity value from year to year as the relevant indicator in the t-tests.

Data

The main source of data is the SynThesys Life database of Standard & Poor's, which is compiled from insurers' regulatory returns. In 1999, there were 122 UK-authorized life insurers that had liabilities on participating contracts.[4] By 2010, that number had decreased to 68, evidencing industry consolidation, with the assets and liabilities of some insurers being transferred to others.

The prudence margin in the valuation of liabilities is estimated as the excess of the 15-year government bond yield over the discount rate used by the insurer. Data are hand-collected from insurers' regulatory returns where available (Table 2). Admissible assets are from SynThesys Life.

To investigate maturity values of policies, we use an annual survey carried out by *Money Management* magazine (see Wassall, 2011 and earlier issues) showing the values on 25-year endowment assurance policies, which are commonly affected to help policyholders repay a mortgage loan. The data show the proceeds of a policy effected by a 30-year-old male paying a premium of £50 per month and maturing in February (Table 3). This reflects decisions taken by the insurer at the end of the previous year on the bonuses to be added to policies. The values for policies maturing in February 2009 are, therefore, attributed to 2008 and so on. In some

4. Excluded are two insurers whose only participating contracts were health insurance products, and one insurer where the policies participating in profits were, unusually, unit-linked, i.e., without the guarantees and smoothing that usually characterize participating policies.

cases, an insurer operates two funds, usually having acquired another insurer, the liabilities of which are retained in a separate fund. The maturity values are given for each. Data on surrender values are taken from the same magazine, although starting only in 2006 as the sample was very small previously.

Table 2:
Prudence Margin in Discount Rate

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Prudence margin in discount rate												
No. of insurers	41	51	41	29	51	45	40	40	40	39	35	34
Mean	1.60%	1.45%	1.33%	0.54%	0.83%	0.44%	0.26%	0.40%	0.32%	-0.17%	0.45%	0.40%

Prudence margin in discount rate = Redemption yield on 15-year UK government bonds minus discount rate used in calculating life insurance business liabilities (in each case net of tax).

Charges to policyholders are available for realistic reporters, which disclose the value of their future charges as an asset. This is divided by the value of policy liabilities to give a "charges ratio" from SynThesys Life.

Table 3:
Management Actions to Share Burden with Policyholders

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Maturity values												
No. of funds	35	33	29	31	30	31	49	54	63	65	62	60
Average (£)*	98,370	95,718	87,169	72,732	63,551	56,799	50,430	54,596	50,930	45,236	39,652	38,957
Surrender values												
No. of funds								35	36	47	40	32
Average (£)*								6,038	6,050	5,605	5,814	6,780
Charges ratio												
No. of insurers						38	37	35	36	37	33	32
Average						3.34%	3.06%	2.51%	2.47%	3.20%	2.86%	2.61%

*Unweighted
Maturity value = Maturity value on a 25-year endowment assurance policy effected by a 29-year-old male paying a premium of £50 per month, maturing 1–2 months after the end of the year shown.
Surrender value = The surrender value on a similar 25-year endowment assurance policy surrendered 10 years after commencement.
Charges ratio = Present value of charges divided by policy liabilities.

Investment strategy is considered using the proportion of each of bonds, equities and real estate in the assets attributable to participating business. Data are available from SynThesys Life from 2005. Prior to that, we rely on industry averages published in *Money Management*. Table 4 also shows these figures for 2005, which are generally close to those in SynThesys Life.

Table 4:
Investment Mix

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
No. of insurers							75	70	64	63	58	57
Bond proportion												
from SynThesys Life							40.4%	40.3%	39.4%	47.6%	49.7%	46.7%
from *MM**	21%	20%	23%	36%	33%	34%	38%					
Equities proportion												
from SynThesys Life							39.6%	39.2%	39.0%	28.9%	27.7%	29.1%
from *MM**	66%	67%	60%	43%	48%	47%	40%					
Real estate proportion												
from SynThesys Life							11.3%	12.2%	11.2%	9.5%	8.8%	9.3%
from *MM**	9%	9%	11%	11%	12%	11%	10%					

*Industry average (unweighted) from *Money Management.*
Bond [equities; real estate] proportion = Bonds [equities, real estate] relating to participating business as a proportion of all participating business assets (based on economic exposure.

Reinsurance is assessed using the ratio of reinsured to total liabilities, from SynThesys Life (Table 5). While this may not adequately express the impact of non-proportional reinsurance, it is a reasonable reflection of risks being transferred, given the data available.

Table 5:
Reinsurance

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Reinsurance ratio	14.6%	15.8%	15.8%	16.8%	19.2%	22.3%	19.7%	27.5%	26.1%	27.4%	26.8%	27.8%

All insurers included as in Table 1.
Reinsurance ratio = Reinsured liabilities as a proportion of total liabilities.

The amount of new business is examined using the measure used by the industry, namely new annual premiums plus 10% of new single premiums (O'Sullivan and Diacon, 2003). The "low strain" proportion is the proportion of new business represented by "low strain products" as described previously. Acquisition costs are divided by the amount of new business. Hence, an acquisition cost ratio of 47% indicates that such costs would be £470 on a policy where annual premiums of £1000 (or a single premium of £10,000) were payable. Data are all from SynThesys Life (Table 6).

Table 6:
Management Actions on New Business

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Amount of new business (£m)												
New participating business	3,714	3,285	3,410	2,927	1,569	1,326	1,020	811	946	1,137	831	889
New business (total)	8,752	8,817	10,950	10,900	9,655	10,347	9,431	10,862	12,666	11,592	8,391	8,670
Low strain proportion	87.9%	90.7%	90.8%	90.7%	85.5%	88.3%	89.0%	91.1%	91.6%	91.6%	85.5%	85.2%
Acquisition cost ratio	65.9%	67.5%	62.9%	62.5%	66.7%	62.8%	63.1%	55.0%	46.9%	47.1%	47.6%	45.1%

All insurers included as in Table 1.
Amount of new business = Annual premiums plus 10% of new single premiums.
Low strain proportion = Of new business from low strain products as a proportion of total amount of new business, where low strain products are unitized products or other products where only a single premium is paid.
Acquisition cost ratio = Acquisition costs (including commission) as a proportion of the amount of new business.

The data in Tables 2 to 6 illustrate trends over the period, and Table 7 shows the results of the paired t-tests.

Table 7:
Results of Paired T-Tests

Year type	Discount rate	Increase in maturity values	Surrender values	Charges ratio	Bonds propn	Equities propn	Real estate propn	Reins ratio	Amount of new business	Low strain propn	Acquisition cost ratio
'Bad'											
2000	**.0000**	**.0046**	n.a.	n.a.	n.a.	n.a.	n.a.	**.0134**	.4877	.3013	X
2002	**.0000**	.0507	n.a.	n.a.	n.a.	n.a.	n.a.	**.0081**	.4891	X	X
2008	**.0001**	**.0000**	**.0000**	**.0046**	**.0000**	**.0000**	**.0000**	.0549	.0862	.1740	.2206
'Good'											
2003	.0598	**.0202**	n.a.	n.a.	n.a.	n.a.	n.a.	X	X	**.0035**	X
2006	**.0051**	.3138	n.a.	.0580	**.0158**	.1538	**.0280**	X	**.0042**	X	X
2009	**.0000**	.2118	.1946	**.0323**	X	.1599	.1217	X	X	**.0348**	.1756

n.a. indicates that data are not available.
Bold figures indicate significant at the 5% level.
X indicates that the change in the indicator was in the opposite direction to that hypothesised.

A brief comment is appropriate regarding inadmissible assets. They amounted to only 0.78% of all assets in 1999. Hence, any reduction could not have a major effect on reported solvency. There was indeed a reduction to 0.06% in 2002, consistent with expectations at a time of adverse financial conditions. Subsequent

to that, they increased, though never to more than 1%. This largely reflects realistic reporters being able to include inadmissible assets in the realistic valuations after 2005. For other insurers, inadmissible assets were at the barely troublesome level of just over 0.1% of total assets. Hence, in practice, inadmissible assets were not a material issue in the global financial crisis because where it mattered (for insurers that were not realistic reporters), actions to reduce inadmissible assets had already been taken in the downturn of 2000–2003. Therefore, this issue is not investigated further.

Findings

This section considers whether the approaches to solvency protection described in the literature review were deployed in 2008 and the other "bad" and "good" years.

The approach of improving the reported (rather than the underlying) financial position is examined using Table 2. In 2008, when the yield on UK government 15-year bonds fell from 4.55% to 3.74%, the problem of increasing liabilities was indeed mitigated by insurers reducing the prudence margin in the discount rate—by 0.49 percentage points on average, from 0.32% to -0.17%. The increase in the margin in 2009 confirms Bunch's (1988) description of a weaker valuation basis as a temporary measure. The t-tests in Table 7 confirm that the reduction in prudence margins in 2008 was significant, indeed at the 0.1% level.

In the two other "bad" years, the reductions were significant at the 0.1% level. In the three "good" years, there were increases, significant at the 0.1%, 1% and 10% level. This is strong evidence that changes in prudence margins were a common response to changes in financial conditions.

The second approach, sharing the burden with policyholders, is examined using Table 3. There was a substantial reduction in maturity values on a 25-year endowment over the period, the mean figure falling by 60% from £98,370 just after the end of 1999 to £38,957 just after the end of 2010. Insurers were reflecting poor investment conditions over 2000–2010 in lower bonuses for policyholders.

Each of 2002-2004 saw average reductions greater than 10%, so the precedent was set for insurers to ignore traditional smoothing practice and to take decisions that fully reflected current adverse circumstances if the situation demanded it, as it did in 2008. This is consistent with insurers regarding a 10% constraint as not sustainable.

Table 7 confirms that the reduction in maturity values in 2008 was significant—indeed, at the 0.1% level. Significant findings at the 5% level apply in another "bad" year (2000) and in a "good" year (2003), while in 2002, it was nearly significant at the 5% level. We conclude that while there was a structural decline in maturity values, insurers often reflected favorable or unfavorable financial conditions in the extent of the decline, and especially so in 2008.

Although the decline in surrender values in 2008 (7.4%) was less than in maturity values, the paired t-tests confirm this was a significant reduction (at the

0.1% level). Surrender values did increase in the "good" year of 2009, though this was not significant at the 10% level.

Information on charges to policyholders is available for realistic reporters from 2004, when 28 out of 38 insurers made charges. Table 7 indicates that the increase in charges in 2008 was significant at the 1% level. The reductions in the "good" years of 2006 and 2009 were significant at the 10% and 5% levels, respectively. The link between charges and financial conditions is, therefore, consistent.

Investment strategy is considered in Table 4, which confirms that 2008 saw insurers moving to a less risky portfolio when solvency was in question. The proportion of assets in bonds increased, with equities and real estate decreasing. The t-tests in Table 7 confirm that all these changes were significant at the 0.1% level. Also significant was the change in the bond proportion in the "good" year of 2006. It increased in 2009, despite this being a "good" year, perhaps reflecting that insurers were unable to move fully to a new desired investment strategy in 2008. In the case of equities and real estate, the proportions moved in the expected direction in the "good" years of 2006 and 2009, although significant in only one case.

Movements in market values likely contributed to these trends, but it was open to insurers in 2008 to restore their equity proportions by buying equities (at bargain prices). The fact that they did not supports that the changes were a response to the global financial crisis. Indeed, it is clear that some insurers were far from passive, with a number of references to actions in 2008 in their annual report and accounts: 1) Homeowners Friendly Society sold all its equities, moving wholly into government bonds and cash; 2) Friends Provident reduced its exposure to equities; and 3) Aviva hedged against further declines in equity prices. Therefore, it is fair to conclude that financial conditions prompted a change in insurers' investments in 2008 and, to some extent, in other years.

Table 5 shows that the reinsurance ratio increased in 2008, as expected, although the t-test indicates that it was not significant at the 5% level (Table 7). This may reflect, to some extent, reinsurers also being subject to financial pressures, which curbed their enthusiasm for new business. The increases in the other "bad" years were significant at the 5% level, but it is hard to interpret whether these were specific responses to adverse financial conditions because the changes in the "good" years were in the opposite direction to that hypothesized. This may reflect that there were other motivations to reinsure. For example, reinsurance helps finance new business, but the volume of new business was falling. Further, the realistic reporting regime meant there was less incentive after 2004 to reinsure in order to avoid the artificialities of the traditional valuation.

Trends in new business are seen from Table 6. New participating business declined sharply from £3,714 million to £889 million over 1999–2010. Although the non-participating business written by these insurers did increase, the total fell. The trend is not surprising: The reducing solvency of these insurers provided insufficient capital to finance large volumes of new business. The growing popularity of unit-linked business, where policyholders received an investment return without smoothing or guarantees, was largely met by other insurers, with

stock firms preferring to establish separate entities to write such business since all profits would then be available for shareholders.

Examining 2008 in particular, the total new business did decrease, although the matched t-tests indicate that it was significant at the 10% rather than the 5% level. From examining the other "good" and "bad" years, it is difficult to conclude that insurers used new business volumes to control their solvency in response to financial conditions. In only one year (2006) was there a relationship as hypothesized and significant at the 5% level.

The year 2008 did see an increased proportion of new business that was products with a design that minimizes new business strain, but the paired t-tests indicate that this was not significant even at the 20% level. While in two "good" years there was a significant reduction in the low strain ratio, we also find that in two of the six years investigated, the effect was in the opposite direction to that hypothesized. The weak relationship may reflect that: 1) most new business was already of the "low strain" variety (85% or more); 2) the amount of new business was low relative to business in force; and 3) for firms that were "realistic reporters," the rules from 2005 reduced the impact of product design on new business strain.

The acquisition cost ratio did decline in 2008, but the matched t-tests indicate that this was not significant even at the 10% level. In none of the six years was the effect as hypothesised and significant at the 10% level.

Focusing on changes in 2008 that were significant at the 5% level, the conclusion is that insurers responded to the adverse financial conditions in seven ways:

- Reducing the prudence margin in the discount rate, leading to a lower reported value of their liabilities than otherwise.
- Reducing maturity values.
- Reducing surrender values.
- Increasing charges.
- Increasing the bonds in the investment portfolio.
- Reducing the equities in the investment portfolio.
- Reducing the real estate in the investment portfolio.

It is also useful to examine to what extent insurers used each of the above seven actions in 2008. There were 22 firms where we have the necessary data. Eight insurers used all seven actions; 10 used six; two used five; and two used four. This confirms that these actions were common responses at the time of the crisis.

It is useful to estimate the impact of these changes on the overall reported solvency ratio. The data do not permit precise calculation, but an approximate assessment can be made. The average prudence margin in the discount rate reduced by 0.49 percentage points from 2007 to 2008. (See Table 2.) It is reasonable to think that, on average, policies have around 10 years to maturity. This suggests that the

change in margin would have led to about a 5% to 6% reduction in liabilities on participating business,[5] or about 2.5% to 3% of overall liabilities.

The solvency ratios reported at the end of 2008 reflected lower claim payments during 2008 as a result of reduced bonuses, which led to lower payouts. Table 3 shows that the bonus decisions in early 2008 reduced maturity values by 6.7% on average. (There was little change in surrender values.) Given that, on average, maturity claims in 2008 were 4.3% of total liabilities, and assuming that 48% of claims related to participating policies (the same as the proportion of liabilities), this implies that the effect of reducing maturity values was 0.14% of liabilities.[6] There were also some reductions in maturity and surrender values over the remainder of 2008, perhaps increasing the effect nearer to 0.2%, although precise information is not available. Further, the increase in the value of charges in 2008 amounted to 0.2% of total liabilities. Regarding the change in the asset mix, this does not change the value of assets as these are at market value; the focus is managing the risk of adverse changes in the future.[7]

As stated earlier, the overall reported solvency ratio was 5.09% at the end of 2008. Given the approximate assessment that lower prudence margins in the discount rate, lower maturity and surrender values and higher charges improved the ratio by 2.5–3, 0.2 and 0.2 percent points, respectively, it is estimated that the overall reported solvency ratio at the end of 2008 would probably have been around 2% without these management actions.

Managing the prudence margin was, therefore, an important part of managing the reported solvency ratio. Having a flexible prudence margin in their valuation assumptions gave insurers room to maneuver in adverse conditions. The increase in prudence in "good" years suggests it was a short-term expedient (see Bunch, 1988). The prudence margin would be evident from scrutiny of an insurer's returns to regulators who would, however, have limited ability to act if an insurer complied with the regulations. Those returns were not commonly studied by consumers or analysts, who would not find it easy to ascertain each insurer's degree of prudence and the effect on reported financial strength. This suggests that customers and their advisers would not respond adversely to manipulation of the prudence margin. This contrasts with other actions that would attract greater publicity and could damage business prospects, namely: 1) reducing payouts; 2) increasing charges; or 3) moving to a more conservative investment strategy. But although manipulating the prudence margin had short-term merit, insurers appeared to see benefit in reinstating a higher prudence margin when conditions permitted, possibly in case analysts

5. Some policies are valued using a discount rate that is gross (as opposed to the above calculations using a rate that is net of 20% tax), so the average reduction in discount rate margin would be around 0.5 to 0.6 percentage points. Broadly, a 1% change in the discount rate would lead to a reduction in the liability by about 10%. This means the liabilities would reduce by around 5% to 6%.

6. The greater reductions in maturity values after the end of 2008 would have affected claims paid during 2009.

7. The timing of changes is relevant: Switching out of equities into bonds before the October 2008 crash would have benefited solvency, but data on when changes were made is not available.

commented adversely on diminished prudence as an apparent permanent feature, and to ensure that, if there were a future crisis, the room to maneuver was available.

The move to a less risky investment strategy is consistent with the finite risk hypothesis, which implies that when firms suffered from losses (in the form of adverse investment returns in 2008), they would take decisions elsewhere to reduce the likelihood of further changes having adverse effects.

Implications for Regulation and Insurance Company Management

Solvency II, the regime now operational in the EU, covers a wide range of matters for the prudential regulation of insurers. It should be seen in the context of the principles we expect to apply to insurance regulation. The view of Skipper & Klein (2000) was that regulation should promote fair competition to promote the goal of having quality, reasonably priced products available from reliable insurers; reliability was especially important, with solvency standards essential for meeting the objective of insurance insolvencies being at an acceptable minimum. Klein (2012) drew attention to the case for regulatory action to prevent insurers from engaging in unfair practices that harm consumers.

Solvency II is not specifically concerned with competition, although, unique to the UK, the PRA has an objective of facilitating competition as far as is reasonably possible (PRA, 2018). Neither does Solvency II regulate insurers' conduct, which the UK covers by a separate body, the Financial Conduct Authority (FCA).

Detailed rules in Solvency II cover the assessment of solvency and capital requirements, with further provisions on enterprise risk management (ERM) and governance. Many insurers have developed their modelling capabilities consistent with the new requirements. Overall, it is fair to think that insurers will be less vulnerable to financial crises in the future.

However, Solvency II does introduce an important change that will restrict how insurers respond to adverse conditions, which inevitably will arise from time to time. While adjusting prudence margins was an important response under Solvency I, this is not possible under Solvency II, which largely removes the prudence and discretion since the discount rate is specified as a risk-free rate. Each month, EIOPA issues the risk-free rates for different terms and currencies and prescribes the Smith-Wilson formula for interpolation and extrapolation. Insurers do have the option of some refinements. In particular, firms that have liabilities with long-term guarantees may seek to use a "matching adjustment," which enables them to use a higher discount rate (PRA, 2015). However, discretion is tightly controlled by the need to meet several conditions, including holding high-yielding assets that match those liabilities.

Therefore, insurers must take a different approach to capital management. In conjunction with defined rules on valuing liabilities, Solvency II introduced a "ladder of intervention" (Swain and Swallow, 2015) with two specified capital

levels; breaching the lower level (minimum capital requirement) leads to more intrusive intervention than breaching the higher level (solvency capital requirement [SCR]). Without flexible prudence margins, it is reasonable to think that insurers will wish to operate with capital above the SCR. Indeed, regulators have found that this appears to be insurers' clear preference to meet rating requirements and to provide a margin of safety against an inadvertent or unforeseen breach (Bulley, 2016). This is a more transparent approach than incorporating prudent margins in discounting liabilities. This approach is acceptable to regulators and should not adversely affect policyholders.

The removal of discretion should benefit regulators, who ought to find it easier to monitor that insurers are using compliant discount rates. A contrast is that, in the case of Equitable Life under Solvency I, regulators had questioned the discount rates used by the insurer's actuary but failed to resolve whether the rates used were within the rules (Parliamentary and Health Service Ombudsman, 2008). In principle, the removal of discretion should also improve competition in the market, as intermediaries and consumers will have access to more consistent data on insurers.

A general lesson for regulators is that insurers may use discretion in valuing their liabilities, if permitted, to manipulate their reported financial position. Regulators expect insurers to manage their business prudently, accepting their obligations to policyholders and managing the risks. However, prudence does not need to be interpreted as requiring liabilities to be overstated (see International Accounting Standards Board, 2018).

Liability calculations involve not only a discount rate but also estimates of future claims. Solvency II requires insurers to use probability-weighted expectations, without prudence in the sense of higher estimates. Because insurers' claim expectations do, however, involve discretion, possibly greater for property/casualty (P/C) than for life insurers, regulators need to monitor how that discretion is used.

UK life insurers also shared the burden of the global financial crisis with policyholders by using discretion to reduce claim values and increase charges. The change to lower-risk investments may also lead to lower claim values. Insurers' discretion in these areas is not affected by Solvency II. The regulators' concern is that policyholders are treated properly and, in particular, that those who claim at a time of crisis are not treated unfairly in comparison with future claimants and/or shareholders. This is an area where regulators accept that insurers use discretion to manage their business, but they can monitor how that discretion is used and intervene if they deem insurers are acting improperly.

EU regulators may need to review whether they have appropriate conduct regulation to check whether policyholders are being treated properly. The FSA (2005, 2011) introduced rules intended to ensure that insurers' conduct treats holders of participating policies fairly. However, the FSA (2011) admitted that one of its rules, concerning how the corporation tax burden on insurers was divided between shareholders and policyholders, had attracted a considerable level of opposition, illustrating that conduct issues are not always straightforward to conclude and implement.

Following the major volume of work to design and implement the prudential regulation that is Solvency II, regulators may now find it easier to prioritize conduct issues. Indeed, EIOPA (2016) has issued a strategy for regulating conduct of business and followed it with a "next steps" document (EIOPA, 2018). But, regulators face a balancing act as they wish insurers to remain solvent and, to do so, insurers naturally wish to exercise discretion on charges and payments to policyholders as fairly provided for in the contracts. Indeed, policyholders who were participating in profits could not reasonably expect to be unaffected by the global financial crisis, which led to reduced profits. However, the way in which insurers cut the benefits to and increased charges on policyholders in adverse conditions highlights the importance of regulators monitoring and, as appropriate, challenging, insurers' conduct of insurers in such circumstances.

Other actions for insurers to improve their finances, although not significant factors in 2008, remain available under Solvency II. These were to increase reinsurance, reduce new business, concentrate further on products with low new business strain and reduce acquisition costs.

The position of UK insurers is complicated by the announcement of the UK's exit from the EU. It is expected that, for a time after the exit, there will be a transitional period when EU rules continue to apply in the UK. Thereafter, a future UK regime could depart from Solvency II, although regulators have declined to speculate on where and how (PRA, 2018). The UK's Treasury Committee (2017) raised a number of concerns about Solvency II, including the capital that insurers are required to hold. Regulators accept some of the comments, although they refer to constraints in the Solvency II rules. These may be relaxed following the UK's exit, although significant departures from Solvency II may mean it is less easy for UK insurers to trade in the EU. There have been no suggestions for reverting to the discretion that insurers had on discount rates in Solvency I.

Conclusions

The first decade of the 21st century was clearly a difficult one for participating life insurers. Insurers needed to be aware of the consequences of low interest rates and falling equity prices. Additionally, they needed to have plans to deal with the problems before they ended up in a situation with no room to maneuver. The analysis confirms that the insurers have business models where the risks can be managed, although it is arguable that some firms where the reported solvency fell to relatively low levels may wish they had taken action earlier.

One of the major steps taken by insurers to preserve their solvency was to use their discretion to reduce the prudence margin in the interest rate used to discount their liabilities. That discretion is not available under Solvency II, and insurers need an alternative approach to financial management in order to avoid solvency difficulties.

Insurers also shared the pain of the global financial crisis with policyholders. It is not suggested that this was done unfairly, although clearly there is the potential for customer detriment when benefits are reduced and charges increased, and it is appropriate that EIOPA develops its approach to conduct regulation.

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Genetic Testing in Underwriting: Implications for Life Insurance Markets

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Abstract

This paper discusses and analyzes the problems for life insurers when individuals obtain results from genetic tests that can have bearing on their estimated mortality. Some forms of genetic information are valuable in the underwriting process, especially test results that may be relied on by medical doctors for treatment. To the extent that test results lead to better medical care, underwriting consequences may be favorable. If the information is not allowed for underwriting, insurers will experience some degree of adverse selection, which will raise the cost of coverage for all applicants and reduce the availability of coverage. This paper considers one recent proposal in the state of Florida to extend a ban on the use of genetic test results in health insurance underwriting to life insurance, disability and long-term care (LTC). This paper concludes that the financial consequence of a ban on the use of genetic information in life insurance underwriting could significantly increase the risk of insolvency; legislation that imposes restrictions on the use of genetic information may be a reasonable compromise to a complete ban.

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1. Introduction

While the federal Genetic Information Nondiscrimination Act (GINA, 2008) severely restricts the use of genetic information for health insurance underwriting, there is no such federal rule addressing the use of genetic test results by life insurers.[1] After lengthy debate, Congress agreed that life insurers would be exempt from the requirements of GINA based upon particular characteristics of life insurance products that are, in part, discussed in this paper. Citing the same potential for unfair discrimination and the need to preserve a level of privacy, state legislatures have also been active in proposing regulations that affect underwriting in life insurance, disability and long-term care (LTC).[2]

In the spring of 2019, the Florida legislature considered two proposals (S. 258 and H.R. 879) that would amend s. 627.4301 of the Florida statutes. The current statute imposes a ban on the use of genetic test results by health insurers; the proposed amendments would extend the ban to underwriting in life insurance and long-term care insurance (LTCI). If passed, the proposed amendment would make Florida the first state to ban the use of genetic test information for underwriting purposes in life insurance. Table 1 provides the definition of genetic information in the existing statute along with the relevant parts of s. 627.4301 as amended by these bills. The additional language proposed by the bills is underlined.

Table 1:
Definition of Genetic Information and Relevant Parts of s. 627.4301

Definition: "Genetic information" means information derived from genetic testing to determine the presence or absence of variations or mutations, including carrier status, in an individual's genetic material or genes that are scientifically or medically believed to cause a disease, disorder or syndrome, or are associated with a statistically increased risk of developing a disease, disorder or syndrome, which is asymptomatic at the time of testing. Such testing does not include routine physical examinations or chemical, blood or urine analysis, unless conducted purposefully to obtain genetic information, or questions regarding family history.
Relevant parts of s. 627.4301, where "life insurer" is added by H. 855 or S. 258 include:
"Life insurer" has the same meaning as in s. 624.602 37 and includes an insurer issuing life insurance contracts that grant additional benefits in the event of the insured's disability.
Health insurers, life insurers, and long-term care insurers may not require or solicit genetic information, use genetic test results in the absence of a diagnosis of a condition related to genetic information, or consider a person's decisions or actions relating to genetic testing in any manner for any insurance purpose.

This paper highlights the implications of banning the use of genetic test results in life insurance. The analysis below weighs the positive and negative consequences

1. Prior to the enactment of GINA, many states had enacted restrictions on the use of genetic test results in underwriting, but only for health insurance (Meyer, 1995–1996).

2. For a list of proposed legislation, see the National Health Genome Research Institute at *https://www.Genome.com*.

for maintaining the status quo and for various levels of restrictions on the use of genetic test results. The consequences differ across stakeholders, some of whom are more directly affected (e.g., life insurers and life insurance applicants) and others that are perhaps more indirectly affected (e.g., existing life insurance policyholders and life insurance agents). The analysis in this paper suggests that a complete ban on genetic test information could be detrimental to the industry as the potential for information asymmetry between insurers and applicants continues to grow. Consumers, on the other hand, may or may not benefit from such a ban. On the one hand, consumers who receive positive genetic test results (indicating increased mortality risk) would not be singled out and charged more for coverage. Consequently, consumers with negative test results would be prohibited from using these results to obtain favorable rates. To the extent that state insurance regulators are concerned about the privacy of genetic information and the potential for unfair discrimination, a compromise might include limitations on the use without completely banning the information.[3]

The paper continues as follows. Section 2 explains the importance of underwriting and good faith negotiations between insurers and applicants for insurance. The section emphasizes the potential for anti-selection when individuals have private information that is related to their risk and may, consequently, influence their decision to purchase, and this information would be relevant for the insurer's decision to offer coverage and/or establish a price for the coverage. The consequences are especially severe since the life insurer has only one opportunity to underwrite for a contract that may be in place for decades. Section 3 provides a brief review of the value of genetic testing as it pertains to medical treatment decisions, medical research, and the estimation of morbidity and mortality in a population. This is followed, in Section 4, with a discussion of the social and behavioral considerations surrounding access to genetic tests and the sharing of the results. Section 5 provides the core analysis of the costs and benefits to various stakeholders of banning or limiting the use of genetic test results. The analysis considers examples from a variety of sources to emphasize the likelihood that endowing individuals with private information will lead to adverse selection that has consequences for the entire life insurance market. Section 6 provides a short review of legislative actions pertaining to the use of genetic test information in other states. A final section concludes with a discussion of how legislatures may wish to consider a compromise that would allow time for more research into the implications of a complete ban as the availability and affordability of genetic testing continues to increase.

3. See Klitzman et al. (2014) for a discussion of several possible regulatory approaches.

2. The Life Insurance Underwriting Process

Accuracy in assessing risk is especially important in life insurance; the consequences of over- or under-estimating the risk can be especially severe because the life insurer has only one opportunity to underwrite for a contract that will be in place for decades. In the aggregate, the impact of "noisy" underwriting information from any one individual is likely counteracted by the potential for noisy information from other applicants and/or existing policyholders. Statistically, as insurers compile a large pool of policyholders, the expected outcome for the group becomes more certain.

Criteria used in the underwriting process should contribute to reducing information asymmetries that are relevant for the risk under consideration. From the insurer's perspective, some criteria are less valuable than others because they do not contribute to a more accurate classification of risk. Criteria that are costly to obtain or verify may not be collected if the value of the information is less than the cost to obtain it. Still other criteria may have considerable statistical importance in understanding a risk, but applying these criteria for making underwriting decisions might be unfairly discriminatory and contradictory to the objective of pooling risks. Thus, the underwriting process reflects a balancing of consumer protections with the need for financial solvency.

The application of underwriting criteria is a science unique to each insurer and differs depending on the insurance product. Consumers should expect that any information they divulge may be used by the insurer to decide whether to offer coverage and how much to charge; however, how a company weighs the criteria is not publicly known. Underwriting practices vary from company to company and are proprietary: This is part of what makes the life insurance market competitive to the benefit of consumers. However, the complexity and lack of transparency help explain, to some degree, public misunderstanding of how insurance prices are determined.

One of the primary goals of insurance regulation is to maintain smooth functioning markets. State insurance regulators should carefully consider any actions that affect the availability of coverage against premature death. They must be concerned with whether an insurer's use of underwriting criteria is not unfairly discriminatory and that the premiums charged are not excessive, but are adequate to maintain solvency.

3. The Value of Genetic Information

Since life insurer performance relies heavily on their ability to predict mortality, there may be great value in new information—genetic traits—that is relevant to mortality risk. However, it is important to understand the extent of information that can be gained in this way. Genes are hereditary parts of DNA that are transferred between generations and, subsequently, strongly influence the way one develops.

Technically, genes contain instructions for the development of proteins that determine the structure and function of every cell in the body. Genes can determine physical traits that can cause or contribute to a disease.

More than 5,000 genes have been identified as relating to a particular disease. In some cases, the disease is associated with one gene, while in others, it may be a combination of two or more genes. Those most extensively studied are listed in Table 2. Evaluation of the results of these studies suggests that these particular genes have informational value for underwriting, i.e., predictive value in estimating the probability of developing the disease.[4] In simulations of the consequences for life insurers of precluding the use of genetic test information, both the Canadian Actuarial Society (Howard, 2014) and the Society of Actuaries (SOA) (Lombardo, 2018) consider these 13 genes.[5] Each of these genes has consequences for mortality, but they are not necessarily used in underwriting today.

Table 2:
Genetic Tests with Informational Value for Underwriting

Gene	Penetrance
Breast cancer BRCA1 or BRCA2	75
Hypertrophic cardiomyopathy (HTCM)	69
Dilated cardiomyopathy (DCM)	75
Arrhythmogenic right ventricular cardiomyopathy (ARVCM)	75
Long QT syndrome (Long QT)	25
Brugada syndrome (Brugada)	75
Huntington's disease (Huntington)	95
Polycystic kidney disease (PKD)	100
Myotonic dystrophy (DM1 or 2)	75
Alzheimer's disease early onset – autosomal dominance (ADEO)	100
Hereditary nonpolyposis colorectal cancer (HNPCC)	50
Marfan syndrome (Marfan)	50
Catecholaminergic polymorphic ventricular tachycardia (CPVT)	75

Source: Lombardo (2018).

Over time, as genomic research continues, the number of conditions that can be predicted through a genetic test is likely to increase. A genetic test may be performed on a sample of blood, hair, skin, amniotic fluid or other tissue. The sample is sent to a laboratory, which produces a report that depends on the purpose of the test. For example, a test may be performed to confirm a particular genetic mutation or, conversely, indicate that a person is not a carrier of a specific genetic mutation. Genetic tests may be done for a variety of purposes, including for newborn and prenatal screening and forensic testing for legal purposes. When used for diagnostic testing, the purpose is to rule out or confirm a diagnosis that is suspected based on

4. See Howard, R. (2014) and Lombardo (2018). The figures in the table are the assumptions used by Lombardo (2018), for the U.S. model in 2018, and thus differ slightly than those used by Howard (2014) for Canada in 2014.

5. The genes considered in the analysis are a subset of genes that can currently be identified through genetic tests. The simulations are described in more detail below in Section 5.

physical signs and symptoms. A genetic test can also reveal if someone has a higher than average probability of developing some types of disease later in life. This sort of "predictive" genetic test can establish, for example, that the probability of developing a disease increases from 50% to 90%.

The probability that an individual who tests positive on a particular genetic test will express the associated trait and ultimately develop the disease is referred to as the penetrance of the gene. A mortality ratio can also be applied to each gene, such that a higher rating indicates a higher mortality associated with the genetic trait. This is typically expressed as an addition or percentage of standard mortality. For example, a positive test for the BRCA1 or BRCA2 gene suggests a 350% increase in mortality at the attained age. A positive test for Huntington's disease or for Alzheimer's disease (early onset) both have mortality ratios of 1000%. Other statistics used to evaluate and compare the informational value of these genes include the number of years following testing for which the mortality is taken as standard, i.e., after a positive test, the number of years before the disease will emerge, and the path over time of the increase in mortality from standard. The estimated penetrance of the most-studied genes is shown in the second column of Table 2 and suggests a wide range of informational value.

It is important to note that over time, other types of medical tests—e.g., tests for cholesterol levels—were first considered controversial when initial evidence showed a wide variation in predicted value. Early studies of tests for BRCA revealed wide-varying predictive value, but this predicted value is more settled in the 60% to 70% range, and testing is now better in identifying subsets of the gene that matter more than others. Genetic testing is an evolving science, but many tests already have shown predictive value for mortality and could, therefore, be essential for life insurance underwriting.

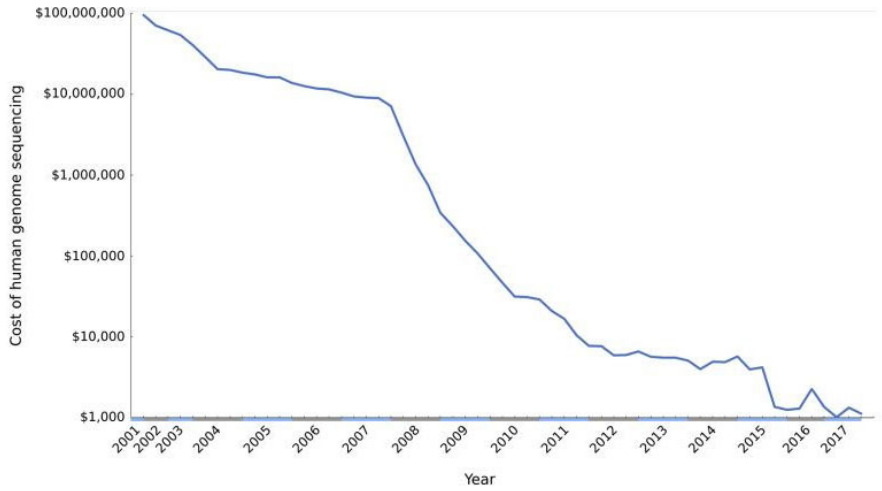
4. Genetic Testing: Social and Behavioral Considerations

The impact of genetic testing on life insurer operations depends greatly on the scale of testing in the population, which was rather limited until the early 2000s. Demand for tests was low due to the prohibitive cost of genetic sequencing—roughly $100 million in 2001. There are several reasons why an individual might take a genetic test. First, it is possible that the individual is already symptomatic and would like to confirm or rule out a specific genetic cause. In this case, the individual's symptoms may have a negative underwriting consequence, but a test could improve the underwriting outcome either because a negative result rules out the genetic cause or the positive result helps in tailoring the medical treatment (Vukcevic & Chen, 2017).

Demand theory implies that as the cost declines, more people will obtain a genetic test, all else equal. The U.S. National Library of Medicine (NLM) reports that "the cost of genetic testing can range from under $100 to more than $2000,

depending on the nature and complexity of the test." The cost of a sequencing test has dropped significantly over the past two decades, as shown in Figure 1. This is largely due to the development of "next generation" and "higher throughput" technologies that enable researchers to test many sequences in parallel, thus making the process more efficient and quicker.[6]

Figure 1:
Cost of Sequencing a Human-Size Genome



Source: National Human Genome Research Institute.

Direct-to-consumer genetic testing has historically been marketed for consumers to obtain genealogical information, which has no value for life insurance underwriting. Increasingly, however, the products available to consumers provide medical information. For example, the vendor 23andMe offers a genetic testing product that evaluates the consumer's risks for certain named diseases, including Parkinson's, celiac, and late-onset Alzheimer's. As the price continues to drop, the demand for these tests that provide medical information is likely to increase. Ancestry.com reported selling approximately 1.5 million genetic testing kits during a Black Friday sale from Nov. 24–27, 2017. Health-based test kits sold by 23andMe were in the top five best-selling items on Amazon in the same period. According to Credence Research, the market for direct-to-consumer genetic tests is expected to grow to $611 million by 2026, up from $117 million in 2017.

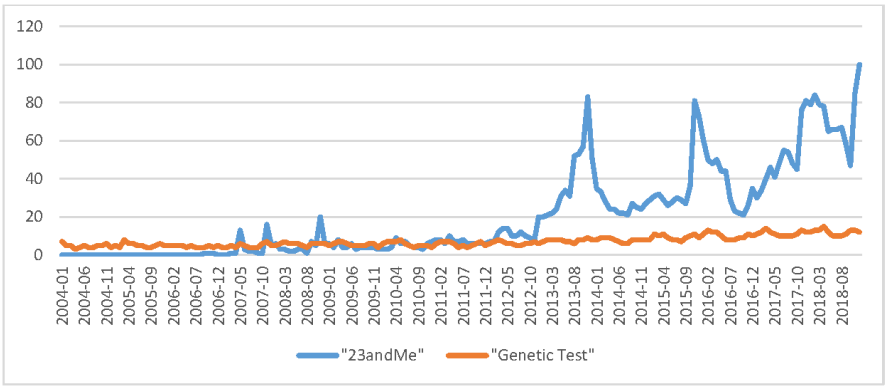
The increased proliferation of genetic testing is accompanied by increased concerns about the privacy of such information (Greene et al., 2015). The privacy protections of the federal Health Insurance Portability and Accountability Act of 1996 (HIPAA) usually do not apply to direct-to-consumer genetic testing because

6. See Adams and Eng (2018) for a review and discussion of the evolution of sequencing methodologies.

the vendors selling such tests are often not "covered entities" and thus not subject to HIPAA. The U.S. Food and Drug Administration (FDA) regulates consumer tests related to health. It authorized the first direct-to-consumer test for detecting genetic variants that may determine how well medications will work in October 2018. The Federal Trade Commission (FTC) recently warned consumers to consider the privacy implications of genetic testing kits and maintains that consumers should not consider genetic tests as a substitute for traditional health care evaluations. Consumer organizations actively educate the consumer on the potential adverse consequences of obtaining a genetic test before having secured life insurance.[7]

Figure 2 provides additional evidence of how interest in obtaining genetic tests is growing. The figure shows that the number of individuals in the U.S. seeking information on genetic tests has grown at a slow but steady pace, while individuals specifically seeking information from 23andMe has increased dramatically in the past five years. The growing interest has important implications for life insurers, who can expect that more and more applicants for coverage will have additional information about their mortality risk.

Figure 2:
Searches for "Genetic Test" and "23andMe" from Google Trends, 2004–2018



Source: Authors search in Google Trends.

Consumer Responses to Genetic Test Results

Consumer testing for genetic information is important in the life insurance context because test information may affect whether one chooses to purchase life insurance, the number of life insurance policies purchased and the amounts of life insurance purchased. Demand for life insurance, generally, is driven by factors such

7. The American Council of Life Insurers (ACLI), in addition to current protections found under current federal and state laws, has publicly stated that it is supportive of additional appropriate protections that could be afforded through consent, authorization and security standards (ACLI, 2019).

as household income, family, education, age and employment. Studies addressing how demand responds to additional information from genetic testing are limited and, to date, have not been conclusive. For example, two studies of women tested for the BRCA1 gene mutation could not confirm evidence of adverse selection in the life insurance market (Viswanathan et al., 2007; Zick et al., 2000). A study of adults tested for Alzheimer's risk also did not find evidence of adverse selection in the life insurance market but did find evidence of adverse selection for LTCI (Zick, 2005). Notably, 17% of those who tested positive changed their LTCI policy in the year after testing positive of Alzheimer's risk, while coverage was changed by only 2% of those who tested negative and 4% of those who did not receive test results. The authors evaluated open-ended comments associated with these changes and confirmed that no respondents decreased their coverage. Rather, their findings suggest an increase in the take-up and expansion of LTC coverage. It is unclear, however, that the findings of studies such as this one, conducted even a few years ago, are relevant given the increasing volume of genetic testing, including those available direct-to-consumer.

One indication of how individuals may respond to genetic test results is evident in the demand for life insurance policies with no medical underwriting. According to Klein (2013), beginning in the mid to late 2000s, there has been renewed interest in "simplified issue" coverage, driven in part by a desire for faster underwriting. The popularity of these types of policies suggests that individuals do have an interest in withholding information that would normally be used in the life insurance underwriting process.

Proponents of banning the use of genetic test results in underwriting for life insurance argue that individuals would be more likely to undergo genetic testing in clinical settings if the information would not be shared with insurers. Fear of "genetic discrimination" was impetus for GINA (2008) and is a widely cited social reason for banning the use of genetic test results (Prince, 2018; Rothstein, 2018). On the other hand, genetic test results could help promote earlier medical intervention and might improve life expectancy. For this reason, allowing insurers access to results of genetic tests has the potential to improve the underwriting situation for many—not only those who receive a negative result, but also for those who get a positive result but take subsequent action to improve their medical condition.

5. Analysis of Potential Outcomes

Genetic tests can reveal important information about an individual's mortality. Preventing life insurers from using this information puts them at a disadvantage when developing adequate rates for coverage. This disadvantage is especially pronounced in life insurance underwriting when compared to health insurance because the life insurer does not have the same opportunity as a health insurer to reprice coverage when new information is revealed. Life insurers generally establish

premiums for long-term and whole life policies that are guaranteed at a certain level. This long-term relationship poses two key problems for the life insurer. First, policyholders who negotiate new coverage with private information about their potential substandard mortality may be underpriced, i.e., priced as if they are standard risks. The increased mortality experience over time will subsequently result in an inadequate pool of premium dollars collected from this cohort to pay the total death benefits, although prices can be raised for the next cohort of policyholders, if necessary. In addition, currently insured policyholders who learn about their increased mortality risk will be more likely than the standard risk policyholders to keep their insurance coverage active. Insurers generally expect a proportion of policyholders will let their coverage lapse, and this factors into pricing decisions. Policyholder lapse behavior that departs from the norm, i.e., due to some individuals having private information about their mortality risk, affects the accuracy of pricing.

The consequences of a ban on using genetic test results on insurers is illustrated here using two approaches. The following approach provides a simple analysis of how misestimation of mortality and lapse experience affects life insurer solvency. The analysis uses realistic estimates of mortality and lapse behavior to calculate breakeven premiums. No additional assumptions are made about how individuals or the market will respond. Rather, this approach simply shows how misestimation—due to individuals' private information about their mortality—is related to the deterioration of the insurer's ability to pay claims over time. The reader is invited to review the 2018 SOA report for a more comprehensive examination of the effects of banning genetic test information in the U.S. life insurance market, which considers potential changes in testing behavior and demand for life insurance.

Simple Analysis of Breakeven Premiums

In the following analysis, the implications for the life insurer are simplified to illustrate the financial consequences when policyholders have private information about their mortality. The analysis emphasizes the consequences by evaluating breakeven prices (i.e., the amount an insurer needs to charge to cover only expected future death benefits) under different assumptions about mortality information. While the example is purposely simple, it explains how adverse selection results from private information and how, in the extreme, this can lead to an unraveling of the insurance market altogether.

The analysis involves a 10-year term policy. Of course, the consequences for different types of insurance coverage will differ; the consequences for a 10-year term policy are not nearly as great as those for a longer term or whole life policy, simply due to the number of years at which information can be learned and revealed (or not revealed). In this example, the policy is sold to males, age 40, who are non-smokers in good health. For the purposes of the analysis, it is assumed that 10,000 policies are sold, and each policy has a face value of $100,000. For tractability, all death benefits are assumed to be paid out at the end of the year in which deaths occur, and a discount rate of 5% is used for discounting future values. For simplicity,

any additional amount that would be necessary to cover administrative expenses and profit are not included.

The implications of private information are illustrated as variations from a baseline scenario, shown in Panel A of Table A-1 in the Appendix. The first set of columns (A–G) in the table show the annual expected mortality experience. In year one, the pool of insureds at the beginning of the year (BOY) is 10,000. In each subsequent year, the pool size is shown to decline due to the expected mortality experience in the pool and 500 policies that are expected to lapse each year. The breakeven premium is calculated by first considering the expected death benefits that must be paid each year (shown in column H). These are discounted to present value (column I) to obtain the amount today that would be necessary to meet all expected future obligations, shown at the bottom of column I. Finally, column J shows the factor applied to each year's experience to account for the fact that: 1) premiums collected in any year will earn interest until needed to pay claims; and 2) the pool of individuals from whom premiums can be collected each year is decreasing over time. The annual level premium is calculated by dividing the present value of the total expected benefit payments per policyholder by the present value (PV) factor of 6.3849.

Columns K–N illustrate the changes to the insurer's balance of expected premiums collected minus expected benefits paid over the 10-year period, including interest that is earned on the balance each year. The values in Column N illustrate that if the insurer charges each policyholder $226.30 at the beginning of the 10-year term and charges all policyholders who remain in the pool $226.30 each year, it will accrue funds just sufficient to make all expected death benefit payments for this cohort of 10,000 insureds by the end of the 10 years.

Panels B–D of Table A-1 provide three alternative scenarios for comparison with the baseline result. The scenarios are arbitrary but are designed to illustrate how misestimation of either the mortality information (Panel B and Panel C) or lapse experience (Panel D) can affect the insurer's solvency, i.e., ability to meet the expected death benefit obligation.

First, consider that the insurer may underestimate the mortality experience of this pool of insureds. This is possible if just a small proportion of the insureds are now more likely to be substandard risks, but the insurer is not aware of this. The table shows how a difference in the probability of death of just 0.00005 in each year results in only a small change in the total number of deaths over the time period (188 to 192), but if the insurer charges only $226.30 per policyholder, it will have insufficient funds in year 10 to pay all death benefits for which it is obligated.

In Panel B, if the insurer had charged each policy holder $231 each year, it would expect to break even. While the insurer cannot change the premium for this cohort, the insurer must respond to the new mortality experience by increasing premiums for the next year's cohort, and it must do this for every policyholder since it cannot determine which policyholders are substandard. While the premium increase that is suggested in this example is small ($5 more per year), any increase in premiums has the potential to affect demand for coverage. Individuals with a greater need, i.e., higher mortality risk, will be more likely to purchase coverage

while individuals with a lower need, upon receiving a higher price, may decline coverage. Thus, subsequent cohorts face increasing prices and the insurer experiences higher-than-expected mortality, leading to another price increase for the next cohort. Panel C provides an indication of how this plays out if the insurer's estimates of mortality are off to an even greater degree due to this adverse selection over time. In Panel C, where the insurer's mortality estimates are off by 20%, the insurer is insolvent by the fifth year of coverage.

The figures in Panel D illustrate what happens when the insurer overestimates the lapse rate on policies purchased by the cohort. This is possible if only a small proportion of individuals in the cohort have received genetic test results that suggest increased mortality risk, or subsequently obtain positive genetic test results after they have purchased coverage and, consequently, decide to hold onto the life insurance coverage when they may have let it lapse without this information. We might assume that the individuals more likely to keep coverage will be those who have positive genetic test results, which would, consequently, increase the mortality rates over the contract period as well. However, for simplicity, the mortality rates are not changed in this scenario, so that the effect of the change in lapse rate is isolated. The scenario suggests that the insurer is unable to meet the expected death benefit obligation in the 10^{th} year. If the insurer continues to note a reduction in lapse behavior, premiums for future cohorts will have to increase. Since the insurer cannot identify a priori which applicants are more likely to lapse, it will have to charge all applicants in subsequent cohorts a higher premium in order to ensure solvency.

A more likely scenario, over time, is one in which the mortality experience of the pool increases (as shown in the change from Panel A to Panel B), and coverage lapses decline (as shown in the change from Panel A to Panel D). These changes lead to the so-called "death spiral" in which insurers are forced to increase rates to stay solvent; however, increasing rates continue to discourage standard risks from purchasing coverage, resulting in an increasingly larger share of substandard risks in the pool. While it is not clear how fast such a process would play out in this arena, the phenomenon suggests that eventually, premiums are so high that the insurer may attract only the highest risks, if it attracts any applicants at all.

The analysis shows that if the information obtained from a genetic test is kept private, and the results would have been relevant for underwriting, adverse selection will increase. This happens in two ways, specifically: 1) through a change in the risk profile of applicants seeking coverage; and 2) through a change in the risk profile of policyholders who keep their coverage through the policy period. With more and more genetic tests being performed, the potential for adverse selection grows, creating further complications for the market. To remain financially viable, life insurers must increase prices to account for the changing composition of the risk pool, and the increase in prices will increasingly drive the lower (or standard) risk-types out of the market as their demand for coverage responds to the price increase. Ultimately, adverse selection will affect the affordability of products, and consequently, availability is reduced as insurers are unwilling or unable to participate in the market.

The SOA Model

The SOA produced a report in 2018 (Lombardo, 2018) that considers the impact of genetic testing in life insurance. The report contains a simulation of the outcomes for the U.S. life insurance market under various assumptions about the information value of genetic tests (e.g., the prevalence and rating of certain genes), incorporating individual and insurer responses to the information.[8] The report concludes that "legislation prohibiting the use of genetic information and family history during the underwriting process has the potential to materially affect U.S. life insurance industry claims." They estimate the following impacts:

- "If only the applicant knows the result of genetic testing, but both the applicant and the insurance company know the family history at time of underwriting, the present value of new business claim costs modeled increase by 4% to 8% overall, and industry-wide claim costs could rise by as much at 3% on a present value basis.
- If the applicant alone knows the result of genetic testing and family history and the insurance company knows neither, the present value of new business claim costs modeled increases by 5% to 10% overall, and industry-wide claim costs could rise by as much at 4% on a present value basis.
- In general, estimated increases in industry-wide claims cost are low at first and increase over time. In the first 10 years, projected modeled claims increase by less than 1%. The cost increase rises quickly over the next 20 years to upwards of 5% of projected claims, as the Baseline In Force and New Business policies run off." (pp. 32-33)

The analysis by the SOA contains several assumptions, and the results are sensitive to the validity of these assumptions. While it is reasonable to assume the volume of genetic testing will increase, for example, the rate of increase and the corresponding increase in the information that may be relevant for underwriting cannot be predicted. Further, the change in demand for coverage—interest in obtaining greater amounts of life insurance coverage or elasticity of demand with respect to the changes in price—is also unclear. For this reason, the SOA study includes several sensitivity tests using different ranges of assumptions.

6. State Developments

According to the National Human Genome Research Institute (NHGRI), states have enacted or proposed more than 792 statutes pertaining to genetic information.

8. The SOA approach follows the simulation approach used by Howard (2014) for Canada, with some different assumptions.

To date, 68 statutes extend underwriting restrictions to other forms of insurance besides health insurance.[9] Many of the statutes that target life insurance operations impose limitations on life insurers' ability to require a genetic test or perform a genetic test without informed consent. A sample of current provisions (as of early 2019) that impose restrictions on life insurers is shown in Table 3 along with the statute information. No state has enacted a complete ban on the use of genetic test information for the purposes of life insurance underwriting.

7. Conclusion

In addressing the question of whether life insurers should be allowed genetic test information for the purposes of underwriting, a variety of issues must be considered, and the conclusions are not black or white. Some forms of genetic information are valuable in the underwriting process, especially test results that may be relied on by medical doctors for treatment. To the extent that test results lead to better medical care, underwriting consequences may be favorable. If the information is not allowed for underwriting, insurers will experience some degree of adverse selection, which will raise the cost of coverage for all applicants and reduce the availability of coverage.

State insurance regulators need to strike a balance between insurers' need for accurate underwriting information and the concerns of the medical community and consumers. Some form of compromise may be possible, such that a complete ban would not be imposed on the use of genetic testing information. Table 4 shows a new subsection to Florida s. 627.4301 that was proposed in an amendment to Senate Bill 258, filed April 5, 2019. The amendment would restrict the use of genetic test information without imposing a complete ban. Item (3)(c) puts the burden on life insurers to justify underwriting decisions with objective statistical evidence related to actual or anticipated loss experience, and thus allows for, and even encourages, further study on the statistical accuracy of this information for underwriting. A complete ban would necessarily complicate insurers' ability to perform statistical analysis of genetics information and the impact on mortality experience.

The discussion and analysis in this paper emphasize the problems for life insurers when individuals have private information about their mortality. The financial consequence—a need to maintain solvency in order to meet obligatory death benefit payments—is significant and sizable. Restrictions may be necessary to placate concerns from consumers and the medical community, but a well-functioning life insurance market requires that insurers be allowed access to information that is material in providing financially viable life insurance products.

9. Roughly 29 state bills failed or died in committee; several other bills, including those proposed in Florida, are still under consideration.

Table 3:
State Provisions Affecting Genetic Testing in Life Insurance Products

Provision	State (statute)
Information about a genetic condition may not be used for underwriting or ratemaking of life and disability insurance policies unless supported by the applicant's medical condition, medical history, and either claims experience or actuarial projections.	Arizona §20-448
Life and disability insurers may not discriminate based solely on the fact that the person to be insured carries a gene that may be associated with disability in that person or the person's offspring, but which causes no adverse effects in the carrier, including, but not limited to, Tay-Sachs trait, sickle cell trait, thalassemia trait and X-linked hemophilia trait.	California §10140
Policies may only limit benefits otherwise payable if loss is caused or contributed to by the presence or absence of genetic characteristics if the insurer imposes limitations for other medical conditions that present an increased risk.	California §10146
Insurers may not refuse to issue or deliver any policy of life insurance or disability insurance that affords certain services and benefits or impose a higher premium rate or charge for those policies solely because the person to be insured has the sickle-cell trait.	Florida F §626.9706 et seq.
Life, disability income or long-term care (LTC) insurers also may not provide for rates or any other aspect of coverage that is not reasonably related to the risk involved.	Kansas §40-2259
Life, credit life, disability, LTC, accidental injury, specified disease, hospital indemnity or credit accident insurers, or an annuity may not discriminate unfairly, which includes the use of genetic test results in a manner that is not reasonably related to anticipated claims experience.	Maine 24A §6981
Unless there is actuarial justification, an insurer may not refuse to insure or make or allow a differential in ratings, premium payments or dividends in connection with life insurance and annuity contracts because the applicant or policyholder has the sickle-cell trait, thalassemia-minor trait, hemoglobin C trait, Tay-Sachs trait or a genetic trait that is harmless in itself.	Maryland §27-208
An insurer, agent or broker authorized to issue life insurance policies, policies against disability from injury or disease, or policies for LTC may not practice unfair discrimination because of the results of a genetic test or the provision of genetic information or require an applicant to undergo a genetic test as a condition of issuance or renewal of a policy. Unfair discrimination involves discriminatory practices against persons unless such action is based on reliable information relating to the insured's mortality or morbidity and based on sound actuarial principles or actual or reasonably anticipated claim experience. These insurers may ask if an applicant has taken a genetic test.	Massachusetts MGL 175 §1081, §180E
The rejection of an application or the determining of rates, terms or conditions of a life or disability insurance contract is permissible if the applicant's medical condition and history, as well as either claims experience or actuarial projections, establish that substantial differences in claims are likely to result from the genetic condition.	Montana §33-18-206
Discrimination by an insurer against a person or his/her family member based on genetic analysis, genetic information or genetic propensity is prohibited. Life, disability income or long-term care insurance (LTCI) are exempt if use is based on sound actuarial principles or related to actual or reasonably anticipated experience.	New Mexico §24-21-1 et seq.
No insurance company may refuse to issue or deliver any policy of life insurance solely by reason of the fact that the person to be insured possesses sickle cell trait or hemoglobin C trait. A policy also may not carry a higher premium rate or charge by reason of the fact that the person to be insured possesses these traits.	North Carolina §58-58-25
The genetic information of a person's blood relative may not be used to reject, deny, limit, cancel, refuse to renew, increase the rates of, affect the terms and conditions of, or otherwise affect any policy of insurance.	Oregon §746.135
It is an unfair method of competition or unfair and deceptive act or practice to make or permit any unfair discrimination against any individual by conditioning insurance rates, the provision or renewal of insurance coverage, or other conditions of insurance based on the results of genetic testing where there is not a relationship between the information and the cost of the insurance risk that the insurer would assume by insuring the proposed insured.	Vermont VSA 8 §4724

Source: Author's search of statutes in the Genome Statutes and Legislation Database at *www.Genome.gov*, Aug. 20, 2019.

Table 4:
Amended Language – Restrictions on the Use of Genetic Information

(3) RESTRICTIONS ON THE USE OF GENETIC INFORMATION BY LIFE INSURERS, LONG-TERM CARE INSURERS, AND DISABILITY INCOME INSURERS.

(a) A life insurer, long-term care insurer, or disability income insurer may not:

1. Require an applicant to take a genetic test;
2. Collect an applicant's genetic information or genetic test results without the applicant's authorization; or
3. Consider the results of a genetic test that is designed to share information with an individual concerning the applicant's race, ethnicity, or national origin and that is not related to an applicant's medical condition or future health risk.

(b) A life insurer, long-term care insurer, or disability income insurer may only consider genetic test results included in an individual's medical record if the tests have been reviewed and confirmed by the individual's physician and the insurer complies with paragraph (c).

(c) A life insurer, long-term care insurer, or disability income insurer may not cancel, limit, or deny coverage, or establish differentials in premium rates, based on genetic information unless such action is based on objective statistical evidence related to actual or anticipated loss experience that is relevant to an individual's life expectancy or health. A life insurer, long-term care insurer, or disability income insurer shall document the rationale for such action and provide the documentation to the office upon request.

(d) Genetic information, including genetic test results, is nonpublic, private health information and is subject to the privacy protections under ss. 626.9651 and 760.40.

(e) This subsection does not relieve the obligation of a life insurer, long-term care insurer, or disability income insurer to comply with ss. 626.9706 and 626.9707.

(f) This subsection does not apply to health insurers.

(g) This subsection applies to policies entered into or renewed on or after January 1, 2020.

Appendix Table A-1:
Effects of Misestimation of Mortality or Lapse Rates in Level Premium Term Coverage

PANEL A: Baseline

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Year	Age	P(Death)	# BOY	# Deaths	# Lapses	# EOY	Claims Payments	PV of Payments	PV Factor	Beginning Balance	Premiums Collected	Interest	Ending Balance
1	40	0.00179	10000	17.9022	500	9482	$1,790,218.99	$1,704,970.46	1.00000		$2,262,969.65	$113,148.48	$585,899.15
2	41	0.00191	9482	18.1031	500	8964	$1,810,310.40	$1,642,004.90	0.90306	$585,899.15	$2,145,769.96	$136,583.46	$1,057,942.16
3	42	0.00204	8964	18.3105	500	8446	$1,831,045.63	$1,581,726.06	0.81306	$1,057,942.16	$2,028,524.80	$154,323.35	$1,409,744.67
4	43	0.00219	8446	18.5056	500	7927	$1,850,560.85	$1,522,460.99	0.72957	$1,409,744.67	$1,911,232.71	$166,048.87	$1,636,465.41
5	44	0.00236	7927	18.7052	500	7408	$1,870,522.39	$1,465,603.24	0.65217	$1,636,465.41	$1,793,896.47	$171,518.09	$1,731,357.58
6	45	0.00254	7408	18.8239	500	6890	$1,882,392.20	$1,404,670.05	0.58047	$1,731,357.58	$1,676,515.05	$170,393.63	$1,695,874.06
7	46	0.00275	6890	18.9594	500	6371	$1,895,937.54	$1,347,407.41	0.51412	$1,695,874.06	$1,559,106.77	$162,749.04	$1,521,792.33
8	47	0.00302	6371	19.2268	500	5851	$1,922,676.16	$1,301,342.91	0.45275	$1,521,792.33	$1,441,667.84	$148,173.01	$1,188,957.01
9	48	0.00335	5851	19.5794	500	5332	$1,957,935.39	$1,262,102.61	0.39605	$1,188,957.01	$1,324,168.40	$125,656.27	$680,846.29
10	49	0.00372	5332	19.8181	500	4812	$1,981,807.23	$1,216,657.72	0.34370	$680,846.29	$1,206,589.17	$94,371.77	$0.00
								$14,448,946.34	6.3849				
								$226.30					

PANEL B: Probability of death underestimated by 0.00005

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Year	Age	P(Death)	# BOY	# Deaths	# Lapses	# EOY	Claims Payments	PV of Payments	PV Factor	Beginning Balance	Premiums Collected	Interest	Ending Balance
1	40	0.00184	10000	18.4022	500	9482	$1,840,218.99	$1,752,589.51	1.00000		$2,262,969.65	$113,148.48	$535,899.15
2	41	0.00196	9482	18.5762	500	8963	$1,857,622.93	$1,684,918.76	0.90301	$535,899.15	$2,145,656.81	$134,077.80	$958,010.82
3	42	0.00209	8963	18.7566	500	8444	$1,875,661.96	$1,620,267.32	0.81297	$958,010.82	$2,028,304.58	$149,315.77	$1,259,969.21
4	43	0.00224	8444	18.9247	500	7925	$1,892,471.19	$1,556,940.73	0.72945	$1,259,969.21	$1,910,911.53	$158,544.04	$1,436,953.60
5	44	0.00241	7925	19.0972	500	7406	$1,909,715.30	$1,496,311.91	0.65202	$1,436,953.60	$1,793,480.44	$161,521.70	$1,482,240.45
6	45	0.00259	7406	19.1886	500	6887	$1,918,856.73	$1,431,880.43	0.58030	$1,482,240.45	$1,676,010.33	$157,912.54	$1,397,306.59
7	46	0.00280	6887	19.2966	500	6368	$1,929,658.71	$1,371,372.42	0.51592	$1,397,306.59	$1,558,519.51	$147,791.31	$1,173,958.72
8	47	0.00307	6368	19.5363	500	5848	$1,953,630.02	$1,322,293.70	0.45254	$1,173,958.72	$1,441,004.30	$130,748.15	$792,081.15
9	48	0.00340	5848	19.8609	500	5328	$1,986,091.80	$1,280,252.48	0.39583	$792,081.15	$1,323,434.81	$105,775.80	$235,199.95
10	49	0.00377	5328	20.0714	500	4808	$2,007,139.46	$1,232,209.52	0.34347	$235,199.95	$1,205,791.86	$72,049.59	($494,098.06)
								$14,749,036.78	6.3835				
								$231.00					

Panel C: Probability of death underestimated by 20 percent

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Year	Age	P(Death)	# BOY	# Deaths	# Lapses	# EOY	Claims Payments	PV of Payments	PV Factor	Beginning Balance	Premiums Collected	Interest	Ending Balance
1	40	0.00215	10000	21.4826	500	9479	$2,148,262.78	$2,045,964.56	1.00000		$2,262,969.65	$113,148.48	$227,855.35
2	41	0.00229	9479	21.7155	500	8957	$2,171,552.19	$1,969,661.85	0.90272	$227,855.35	$2,141,959.71	$118,640.75	$319,903.62
3	42	0.00245	8957	21.9549	500	8435	$2,195,491.64	$1,896,518.22	0.81241	$319,903.62	$2,026,897.07	$117,340.03	$268,649.09
4	43	0.00263	8435	22.1782	500	7913	$2,217,823.50	$1,824,608.88	0.72863	$268,649.09	$1,908,780.26	$108,871.47	$68,477.32
5	44	0.00283	7913	22.4052	500	7390	$2,240,518.29	$1,755,504.71	0.65098	$68,477.32	$1,790,612.91	$92,954.51	($288,473.55)
6	45	0.00305	7390	22.5332	500	6868	$2,253,318.38	$1,681,460.87	0.57905	($288,473.55)	$1,672,394.20	$69,196.03	($800,201.69)
7	46	0.00330	6868	22.6789	500	6345	$2,267,886.82	$1,611,744.82	0.51248	($800,201.69)	$1,554,146.53	$37,697.24	($1,476,244.74)
8	47	0.00362	6345	22.9793	500	5822	$2,297,926.09	$1,555,326.83	0.45093	($1,476,244.74)	$1,435,865.89	($2,018.94)	($2,340,323.88)
9	48	0.00402	5822	23.3772	500	5299	$2,337,721.12	$1,506,915.88	0.39406	($2,340,323.88)	$1,317,517.27	($51,140.33)	($3,411,668.06)
10	49	0.00446	5299	23.6337	500	4775	$2,363,365.45	$1,450,901.37	0.34156	($3,411,668.06)	$1,199,078.59	($110,629.47)	($4,686,581.39)
								$17,298,637.99	6.3728				
								$270.93					

Panel D: Lapse Rate overestimated

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Year	Age	P(Death)	# BOY	# Deaths	# Lapses	# EOY	Claims Payments	PV of Payments	PV Factor	Beginning Balance	Premiums Collected	Interest	Ending Balance
1	40	0.00179	10000	17.9022	200	9782	$1,790,218.99	$1,704,970.46	1.00000		$2,262,969.65	$113,148.48	$585,899.15
2	41	0.00191	9782	18.6759	200	9563	$1,867,586.03	$1,693,955.58	0.93163	$585,899.15	$2,213,659.04	$139,977.91	$1,071,950.07
3	42	0.00204	9563	19.5349	200	9344	$1,953,488.65	$1,687,496.94	0.86743	$1,071,950.07	$2,164,173.36	$161,806.17	$1,444,440.95
4	43	0.00219	9344	20.4737	200	9123	$2,047,368.93	$1,684,375.49	0.80716	$1,444,440.95	$2,114,493.28	$177,946.71	$1,689,512.01
5	44	0.00236	9123	21.5279	200	8902	$2,152,789.76	$1,686,767.11	0.75059	$1,689,512.01	$2,064,600.76	$187,705.64	$1,789,028.65
6	45	0.00254	8902	22.6185	200	8679	$2,261,847.87	$1,687,825.71	0.69749	$1,789,028.65	$2,014,469.67	$190,174.92	$1,731,825.36
7	46	0.00275	8679	23.8842	200	8455	$2,388,415.86	$1,697,102.56	0.64766	$1,731,825.36	$1,964,091.78	$184,795.86	$1,492,297.14
8	47	0.00302	8455	25.5184	200	8230	$2,551,837.04	$1,727,183.75	0.60091	$1,492,297.14	$1,913,427.47	$170,286.23	$1,024,173.80
9	48	0.00335	8230	27.5376	200	8002	$2,753,762.94	$1,775,100.14	0.55703	$1,024,173.80	$1,862,393.35	$144,328.36	$277,132.57
10	49	0.00372	8002	29.7438	200	7773	$2,974,383.76	$1,826,013.61	0.51584	$277,132.57	$1,810,902.28	$104,401.74	($781,947.16)
								$17,171,091.36	7.3757				
								$268.93					

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Challenges for the Insurance Industry in the Future

Jack E. Nicholson*

Abstract

The author discusses several development and trends related to insurance that were presented in May 2019 at the Florida State University Future of Insurance Forum, including the role of technology and catastrophe exposures. Advances in technology are changing the insurance industry, and its future workforce will require new skill sets and greater flexibility. The growth of exposures in coastal states, flood zones and earthquake-prone areas will necessitate updated tools for state insurance regulators and rating agencies to monitor financial solvency. More needs to be understood about climate change, the climate models and whether man-made climate change can be linked as a cause of future disasters. Although the loss adjustment processes of insurers have improved over time, the settlement of catastrophic claims entails continuing problems. Insurance linked security (ILS) products are serving to provide additional capital and to stabilize the rapidly growing reinsurance market.

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I. Introduction

On May 8, 2019, the Florida State University College of Business held a conference entitled "FSU Future of Insurance Forum." The author discusses six of the topics presented at the conference. The topics chosen are intended to challenge and stimulate thinking about the future of the insurance industry and its potential transformation. Business, as usual, may no longer be an option, and the speed of change—along with the development of new business models—may become the competitive norm.

A variety of factors are shaping the future of the insurance industry. This article attempts to provide insights into the future of the insurance industry based on recent ongoing trends and developments. Technology and consumer expectations have become driving forces that have heated up the competitive environment. The buildup of exposure in coastal states, flood zones and earthquake-prone areas has become a complex problem that will require sophisticated tools to enhance financial solvency oversight. The issue of climate change and its impact on the insurance industry is complex and needs to be better understood. Overall, insurer loss settlement processes have improved due to beneficial technological changes, but loss settlements also entail inefficiencies, delays, increased costs, fraud and litigation. Insurance linked securities (ILS) products backed by capital provided by the financial markets are supplementing traditional reinsurance capital, increasing market stability and transforming the structure of the world reinsurance markets.

II. Technology and the Insurance Market

Technology is driving innovation and efficiencies for traditional insurers. However, a growing number of newly formed insurers are focusing on consumers by offering them better products and services with new business models designed to disrupt the traditional market. Stephan Binder of McKinsey & Company characterizes the insurance industry as slow to change. He suggests that in the next 10 years, 40% of the jobs that exist today will be gone, and 20% of the jobs in the future will be new. He also predicts that there will be more change in the next 10 years than in the last 100 years (Binder, 2018).

Technology

Recent high-powered technologies such as blockchain, artificial intelligence (AI) and machine learning present the possibility of revamping the insurance system into a type of digital insurance platform. The future development of quantum computers and high-level quantum algorithms is likely to trigger an explosion of possibilities and restructure the entire insurance industry.

Developing technologies have resulted in numerous new tools that are achieving efficiencies and higher profitability for business. The term "InsurTech" is used to characterize the insurance industry's adoption of recent technologies.[1] Numerous firms are supplying new technologies to the insurance industry (CIO Applications, 2019). Blockchain is one such relatively recent technological innovation. It has been reported that "… blockchain technology will become the foundation layer for a new way of doing insurance business,"[2] (Tinianow, 2019). The use of blockchain presents unlimited possibilities for insurers when combined with AI, the Internet of things (IoT) and machine learning.

B3i (Blockchain Insurance Industry Initiative) was formed by a consortium of 16 insurance market participants and involves more than 40 related entities as either shareholders, customers or insurance industry members. Its goal is to build a robust blockchain infrastructure.[3] B3i will own the system and build products and services for its members that will automate tasks by addressing specific inefficient processes. B3i can be viewed as an aggressive industry attempt to initiate innovation "by the market" and "for the market" in order to "enable substantial gains in both efficiency and security, employing the latest technologies…" (B3i, 2019).

In the future, it is conceivable that a type of "Insurance Digital Platform" resembling the B3i concept (see Figure 1) could evolve and operate like Amazon or eBay by incorporating various insurance products and related transactions, thereby enabling competition over price, services and other factors. Consumers may enter through a portal (or gateway) to a "tunnel" consisting of blockchain technology, AI, computer learning, sophisticated algorithms and data sources (big data[4]). Insurers and reinsurers, as well as other service providers, would be positioned at the other end. The tunnel would consist of decision rules for the customer and decision rules for the insurers and related parties. Matching interests could be paired instantaneously at agreed-upon prices, terms/conditions and other relevant criteria. The participating insurers would be able to operate using many different business models to provide consumers with more choices. The overall goal would be to operate at a high level of efficiency, speed and convenience.

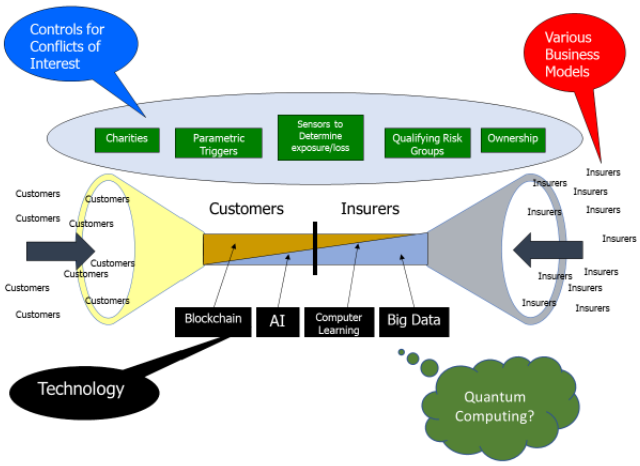
1. Investopedia defines InsurTech as "… the use of technology innovations designed to squeeze out savings and efficiency from the current insurance industry model." See *https://www.investopedia.com/terms/i/InsurTech.asp* for more information.

2. This is a quote from Walid Al Saqqaf, founder of Insureblocks, which is an educational resource for the insurance industry.

3. The B3i organization proclaims, "Our vision is to see the insurance market deliver better solutions for end consumers through faster access to insurance with less administrative cost." See *https://b3i.tech/home.html* for more information.

4. The term "big data" can be defined in several ways. Described very simply, "big data" is data that has greater variety and is increasing in volume at a very high rate of velocity. Thus, the three ""V's" of big data are variety, volume and velocity.

Figure 1:
Digital Insurance Platform
(The Future of the Industry)



Source: Nicholson, 2019

The growth of the internet and the connectivity of people with people, people with machines and machines with machines will likely continue with unprecedented speed. The access to data and the various ways of collecting it have already exploded with the concept of big data. Databases are growing and incorporate traditional structured data, as well as unstructured data. Unstructured data is not organized in a predefined manner and would include text, images, video, audio, keyboard clicks, dates, various facts and opinions.[5] Reinsel, Gantz and Rydning (2018) note that "IDC predicts that the global datasphere will grow from 33 zettabytes[6] in 2018 to 175 zettabytes by 2025"—five times what it is today. Highly sophisticated analytics are now possible, along with the expansion of complex algorithms.[7] The implication for the insurance industry is that it will have access to a greater volume of data, and this will shape its operations in new and different ways in the future.

5. Seqrite (2018) notes that 80% of the data in organizations is estimated to be unstructured data.

6. One zettabyte is equal to a trillion gigabytes. If all the world's data were stored on DVDs, the authors estimated that if stacked, the DVDs would reach the moon 23 times.

7. For a discussion of text analysis and sentiment mining using unstructured data, see Chakraborty and Pagolu (2014).

Innovation and Disruption – New and Creative Business Models

The terms "innovation" and "disruption" have relevance with regard to how the insurance industry is now evolving and will continue to evolve into the future.[8] Traditional insurers are using technology to create certain efficiencies that lead to higher profitability or a more favorable competitive position, which may or may not involve a significant change in their basic business model. Traditional insurers may be at a competitive disadvantage due to their long-established business models and their high-value investments in infrastructure. Any change to a traditional insurer's business model may be extremely difficult or nearly impossible for some insurers since a new business model may involve the cannibalization of the insurer's existing business. However, new start-up insurers may have the flexibility to create a unique or different business model designed to exploit weaknesses in traditional insurers' operations. Even with this advantage, many new start-up insurers may still not survive in the marketplace. Time, as well as consumer acceptance, will eventually determine their success or failure.

Impact on Insurers

Many traditional insurers are experimenting with new business models on a limited basis[9] or are investing in other high-tech companies.[10] Although their vision and goals may change, their business model may not change significantly from what they have been doing in the past. Today, we see insurers offering new smartphone apps, which include those designed to lower or determine premiums more fairly based on driving behavior, report claims faster, speed up and simplify the application process, or quickly compare prices with other providers.

In recent years, new start-up insurers are not only employing innovative technologies, but also they are developing disruptive business models. In 2018, global InsurTech investment spending was estimated at $3 billion, with total spending more than $8.5 billion during the previous five years. These investments included 599 deals, of which more than 50% were completed in North America (Fintech Global, 2019).

8. Bower and Christensen (1995) were some of the first to discuss disruptive technologies. Christensen (1997) authored a book on the subject several years later. Christensen, Raynor and McDonald (2015) discuss how the theory of disruption and its concepts have been widely misunderstood and misapplied over time.

9. State Farm is experimenting with a new business model for automobile insurance. The company has an app called HiRoad, where policyholders' driving behaviors are tracked and are charged more or less based on how safely they drive. The app is fast and can provide quotes within five minutes. Additionally, claims can be filed using the app. State Farm cites increased competitive pressure from other insurers and InsurTech start-ups as the reason it is looking at new business models (Denham, 2018).

10. Prudential recently entered into an agreement with Hælth Tech to integrate its cloud technology with its PRUWorks platform (Osental, 2019).

One of the new InsurTech start-ups that has frequently made the news in the last couple of years is Lemonade Insurance Company. Its co-founders Daniel Schreiber and Shai Wininger started Lemonade in 2015, with the goal of creating a new kind of insurance company (Schreiber, 2018). They began the process by rethinking the insurance industry and imagining how it should be versus how it currently operates. Realizing that insurance is a $1.3 trillion business, which fundamentally has not changed in decades, Schreiber and Wininger focused on ideas that would fix several problems with a system that is perceived as a "necessary evil" rather than as a "social good." Lemonade's focus is on both technology and behavior economics.[11] Their business model is based on technology where policyholders interact with cyber bots rather than with people. The company has reinsurance to protect its solvency and is willing to write a large volume of low premium lines of business, such as coverage for apartment contents. The company claims that it does not make money off its policyholders from insurance operations involving claims. It charges a flat 20% of premiums, and that is all the company takes. Any funds remaining after paying losses are contributed to a charity or cause designated by the policyholder, thereby removing a perceived conflict of interest. Critics of Lemonade contend that it is not unlike other insurers (Lamparelli, 2017). They suggest that the owners of Lemonade will eventually sell the company and move on to start other high-tech businesses. Additionally, the critics question whether Lemonade will be able to survive a catastrophic event. Moreover, they claim that the perceived conflict of interest is not fully resolved since reinsurers are involved, and they might not be satisfied with Lemonade's overly trusting and simplistic policyholder claims settlement process. Several other InsurTech start-ups are described in the Appendix.

In addition to new start-up InsurTech companies, other well-established technology firms have indicated an interest in the insurance business. Simpson (2019) briefly reviews a few of these firms, including Google, Amazon and SoftBank. Additionally, J.P. Morgan, Berkshire Hathaway and Amazon have announced a joint venture for using technology to reduce health care costs for their employees (Henry and Humer, 2018). Many high-tech firms today have raised the standards for customer service and efficiency, and as they enter the insurance business, this may affect the industry. State insurance regulators can view technology as a facilitating mechanism that can help them better accomplish their overall mission of ensuring competitive and viable insurance markets. As with other parts of the industry, regulation is needed for solvency, ratemaking and market conduct activities. New approaches for reducing conflicts of interest between the insurer and the insured should be encouraged.

11. Dan Ariely, a behavioral economist at Duke University, has joined Lemonade as its chief behavioral officer. Dr. Ariely is the author of the book entitled *The (Honest) Truth About Dishonesty* (Baer, 2016).

Observations for the Future

The speed of technological innovation is accelerating at a rapid pace; insurers need to be able to identify future trends and developments to stay a step ahead. Opportunities exists for both traditional insurers and new start-up insurers for capturing market share by creating new business models or revising existing ones. Many new disruptive insurers are recognizing that insurance is a social good and are attempting to design programs that engage their policyholders in ways that reduce or eliminate conflicts of interest. In the future, the application process will be fast and efficient, and claims will be handled in ways that reduce or eliminate policyholder stress. From an insurance regulatory standpoint, state insurance regulators have an opportunity to encourage and take advantage of these types of ideas, which may also solve numerous other problems. For example, insurance business models that resolve conflicts of interest between the insurer and the insured may also lessen fraud, reduce lawsuits and eliminate excessive claims, thus lowering insurance premiums. The role of the state insurance regulator can be expanded by taking a broader view of the insurance system and developing a better understanding of the fundamental causes of its inefficiencies. The better regulatory approach is to determine ways to redesign the system that can avoid fraud and litigation rather than having to accept their consequences.

III. The Future Insurance Workforce

Over the last 10 years, the insurance industry has been viewed as facing a talent shortage resulting from the impending retirement of the "baby boomer" generation and the aging workforce. Cole and McCullough (2012) discussed the topic of the professional skill shortage in the insurance industry and the need to create a unified strategy for both retaining employees as well as attracting future executives. Working with 110 people at an insurance industry conference, Cole and McCullough identified the needed strategy to include the improvement of the insurance industry's reputation, the need for coordination of resources and the enhancement of educational programs.

According to Canás and Burham (2017), many older employees have delayed retirement due to the market crash of 2008 and are working between the ages of 66 and 70. This delay in retirement may exacerbate the transition problem by creating a bigger and more sudden drop-off in insurance industry talent. The demographics show that 1 million millennials are now entering the U.S. workforce annually and are expected to comprise 40% of the workforce by 2020. The authors suggest that this will present challenges for the insurance industry to attract this new talent.

The problem of planning for the future workforce in the insurance industry is that the industry of tomorrow will not be the industry of today. Future employment for the insurance industry should be looked upon as a moving target. The talent gap may be of a much different nature than contemplated only a few years ago. A major

shift is occurring toward automation, and the industry needs employees with digital expertise. McKinsey & Company note that up to 45% of work activities in the U.S. insurance industry can be automated with current technology (Johansson and Vogelgesang, 2016).

For employees in the insurance industry, as well as most businesses today,[12] it will be important to be flexible and to continue to learn. The future will be disruptive not only to insurers but to their employees as well, and employees need to recognize trends and market shifts and be ready to take advantage of future opportunities.

Observations for the Future

The insurance industry workforce of the future is likely to be dramatically different from today. Many entry-level employees and middle managers are expected to be replaced with bots and AI. More and more underwriting will be accomplished with monitors and sensors and other feedback mechanisms tied to the concept of the IoT (Binder, 2018). Sales will likely be more internet-driven and could replace many agents. Innovative and simpler products custom-designed to meet individual needs will replace many of today's complex one-size-fits-all products, thus requiring both fewer agents and fewer claims adjusters (Schreiber, 2018, Tinianow, 2019, and Denham, 2018). From a regulatory standpoint, a more significant concern will be the qualifications and capability of software rather than focusing primarily on traditional licensing of agents. The workforce profile of the insurance industry is likely to evolve such that computers and computer-driven systems (bots and AI) will be doing much of the low-level work, while human engineers will be in high demand to design and enhance marketing, customer service and claims services. Top management will focus on innovation and how to provide customers with better and simpler products. The role of the state insurance regulator will still be to protect the consumer's interest. However, the review process will likely shift toward auditing computer systems and ensuring that they operate fairly and ethically to provide quality service and products for the consumer.

IV. Solvency Implications for Natural Disasters

A growing area of heightened concern is the solvency regulation of property insurers due to their exposure to the risk of natural disasters. The insurance industry, reinsurers, state insurance regulators and rating agencies rely heavily on one measure—the one in 100-year probable maximum loss (PML). Although the PML measure has certain benefits, it is not enough for a comprehensive understanding of

12. According to Dominique Barton, CEO of McKinsey Worldwide, the life expectancy of an S&P 500 company was 90 years in 1935, but today it is only 15 years (Barton, 2018).

an insurer's vulnerabilities to catastrophic losses. For models used in Florida,[13] the PML can vary by a factor of almost two from the highest to the lowest model.[14] This allows for "model shopping" and can influence an insurer's decisions about the amount of resources needed for solvency purposes. Therefore, other ways of viewing the aggregation of exposure are needed.

Before the creation of computer models, various methods of estimation were used to calculate PMLs. Cummins and Freifelder (1978) considered the use of simulation approaches and approximation formulas to estimate PMLs. Aiuppa (1988) suggested the use of Pearson curves as an approximation of PML and concludes that such a method was better than other methods available at the time. Woo (2002) discussed the evolution of PML primarily concerning the earthquake peril and how catastrophe modeling software offered an improvement over the more simplistic deterministic methods in use. Vickery, Masters, Powell and Wadhera (2009) discussed hurricane modeling and its various uses, including the loss exceedance curve. They note that models have changed over time, but that very little attention had been given to assessing various model errors.

Characteristic event (CE) methodology[15] is used by Nicholson, Clark and Daraskevich (2018) to evaluate the vulnerability of insurers and the insurance system in Florida. The CE methodology allows for the identification of "pockets of risk" for recognizing insurer vulnerabilities. The nature of CEs is that they represent specific event probabilities in various areas. The traditional PML approach simulates events to derive a one-number loss estimate. A distinction is that the CEs are designed to be hypothetical events (but not randomly generated events) similar to past hurricanes, with the main difference being the location of landfall and track. CEs are not single numbers. They are calculated for various event probabilities such as one in 20-year events, one in 50-year events, or one in 100-year events at various locations along the coast. The insurer exposure is matched with the wind speed from the various CEs to derive the insurer's loss at various locations along the coast.

Observations for the Future

Relying on a one-number PML approach provides limited information for managing catastrophe risk. State insurance regulators, rating agencies, investors, reinsurers and consumers need to understand the entire profile of an insurer's risk concentrations. Therefore, methodologies are needed to fully describe an insurer's risk exposure with measures for multiple locations. Additionally, there are benefits in modeling the various state insurance systems using the same framework. The insurance system would include various state insurance programs (such as guaranty

13. Based on the computer hurricane models found acceptable by the Florida Commission on Hurricane Loss Projection Methodology (FCHLPM) under the 2015 standards.

14. On June 13, 2019, the FCHLPM accomplished its final review of models for acceptability under its 2017 standards. Six models were found acceptable, which included one new model, the Karen Clark & Company model.

15. CE methodology is an approach developed by Karen Clark & Company in 2012.

funds, joint underwriting associations and state reinsurance programs), which are being relied on by insurers operating in the respective states and their policyholders. If a state program cannot fulfill its obligations, insurers may fail. Updated tools are needed to provide a better understanding of catastrophic risk exposure for monitoring insurer financial solvency and to recognize the vulnerabilities of the various state insurance systems.

V. Natural Disasters and Climate Change

For the past 40 years, the discussion and debate over climate change have been intense. In the last several years, frequent claims have been made that various natural and man-made disasters have been caused by or enhanced by climate change (American Geophysical Union Press Release, 2019, and Keellings and Ayala, 2019).[16] However, a study of 197 U.S. landfalling hurricanes for the period 1900–2017 using normalized losses (adjusted for exposure growth) indicated no trend in hurricane frequency or severity (Weinkle, Landsea, Collins, Musulin, Crompton, Klotzbach and Pielke, Jr., 2018). A similar study normalizing Australian insured disaster losses from 1996–2017 found the same results (McAneney, Sandercock, Crompton, Musulin, Pielke, Jr. and A. Gissing, 2018).

According to a report by Evans (2019b), insurers and reinsurers are viewing climate change as an urgent risk and an increasing threat to their business. The recent natural disasters in 2017 and 2018 have increased the urgency for the insurance industry to deal with climate change as a short-term risk; previously, it was viewed only from a long-term perspective.

IPCC's Role and the Growing Controversy

The major authoritative force behind the modern science of climate change is the Intergovernmental Panel on Climate Change (IPCC).[17] It does not carry out original research; rather, it produces reports based on both peer-reviewed and non-peer-reviewed sources. The reports represent agreements of leading climate scientists and the consensus of participating governments.

16. Bastardi (2018) reviews the history of past hurricanes occurring in the 20th and 21st centuries. He points out that history demonstrates hurricanes were destructive in the past and will be in the future and comments that nature is in control doing what nature does, which is to correct for imbalances.

17. The IPCC was formed in 1988 with its headquarters in Geneva, Switzerland. The parent organizations are the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP). The IPCC produces reports to support the work of the United Nations Framework Convention on Climate Change (UNFCCC). The IPCC's Fifth Assessment Report was a scientific contribution for the UNFCCC's Paris Agreement in 2015. In 2018, the IPCC released the "Special Report on Global Warming of 1.5°C" (IPCC, 2018). The Sixth Assessment Report is planned to be released in 2022.

Recently, government climate change policies around the world are being questioned (Burnett, 2019). Since the climate on earth has always changed, the term "climate change" often is used to refer to man-made climate change or the technical term "anthropogenic climate change."

Christy (2019) summarizes the results of a study that questions the accuracy and the assumptions of climate models that are being relied upon by the IPCC. Using satellite data, which represented a time series of 37.5 years of actual temperature data from the global troposphere, the results indicated that the earth was warming per decade at a rate of .095°C. The climate models used by the IPCC indicated a warming rate of 0.35°C per decade or 3.68 times Christy's findings. The study's conclusion is that the sensitivity of CO_2 in the climate models tends to exaggerate the rate of global warming, implying that the world is warming at alarming levels. This raises serious questions regarding the accuracy of climate models over the next 30, 50 or 80 years and whether such models should be used as the basis for long-term global climate policy.[18]

Climate Change, Disasters and Legal Issues

Stott, Stone and Allen (2004) attempt to estimate the probability of anthropogenic contributions in extreme weather events compared to natural causes using global climate models. Their conclusion, based on a confidence interval of greater than 90%, is that more than half of the extreme weather in Europe in 2003 is attributable to human influences on the climate. The work of Stott et al. (2004) appears to be exploratory and calls for further research, including scenarios using other spatial and temporal events to better support a cause and effect relationship. Nonetheless, from a legal perspective, probability analysis might be enough to support a legal case[19] against those that can be determined to be the probable cause of climate change in the future (Allen and Lord, 2004).

Neil Beresford, a partner at Clyde & Company in London, observes that climate change litigation has given rise to interesting problems of causation. Products that are deemed harmful to the environment are causing some companies, such as petrochemical and energy companies, to be targeted. For example, a manufacturer having a 10% market share may be found to be liable for 10% of the alleged damages (Beresford, 2019).

18. According to the world-renowned theoretical physicist and mathematician, Freeman Dyson, professor emeritus from Princeton (McNish, 2015), "… models do a good job of helping us understand climate, but they do a very poor job of predicting it."

19. Two litigation databases related to climate change have been created in a joint effort by the Sabin Center for Climate Change Law at Columbia Law School and the law firm Arnold and Porter. One database includes 1,045 U.S. cases, and the other includes 287 non-U.S. cases. See *http://climatecasechart.com/*.

Insurance Regulatory Concerns and Climate Change Policy

The National Association of Insurance Commissioners (NAIC) has a Climate Risk and Resilience (C) Working Group, which was initially created in 2006 and originally named the Climate Change and Global Warming (C) Task Force. In 2008, the NAIC created a white paper (NAIC, 2008) to assess global warming and thus mitigate its impact on the insurance industry.

The NAIC adopted its Insurer Climate Risk Disclosure Survey in 2010, which was in response to its 2008 white paper. Insurance regulatory concerns about climate change are based on insurers identifying their climate change risk whether related to their investments or their potential liability from catastrophes caused by climate change. The purpose of the disclosures is for policymakers to gain insights for public policy changes.[20] The premium threshold for insurer reporting is $100 million in direct written premiums. The disclosures are provided in an online survey instrument. The survey results are public and maintained in a database administered by California, which leads a multistate effort to gather information about what insurers are doing to address climate change. (Not all states participate.)

On an April 12, 2019, conference call, Dr. Gerald Geernaert, the director of the Climate and Environmental Sciences Division of the U.S. Department of Energy (DOE), presented[21] a report to the NAIC's Climate Risk and Resilience (C) Working Group (NAIC, 2019). The conclusions of the presentation are definitive and leave no room for doubt that global average temperatures are much higher than modern civilization has ever experienced and are rising, and that human activities are the cause. Various charts illustrate other relationships for projected temperature, precipitation, sea level rise and air quality, as well as the projected impact on delays to transportation, outdoor labor hours worked, coral bleaching and 22 types of economic damages to expect by 2090 due to various warming scenarios. The report illustrates the observed and projected changes due to fossil fuel and industrial emissions of CO_2 arising from human activities.

Comments on the Future

Climate change is contentious, and the topic has divided the scientific community. As a result, determining liability in climate change cases is of importance to state insurance regulators, rating agencies, insurers, reinsurers, policyholders and investors. Given the mixed evidence, this may be an issue of correlation—not causation. Determining liability in climate change cases will be an important issue for state insurance regulators, rating agencies, insurers, reinsurers, policyholders and investors in the future.

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20. For more detailed information, see *http://www.insurance.ca.gov/0250-insurers/0300-insurers/0100-applications/ClimateSurvey/* and *https://www.naic.org/cipr_topics/topic_climate_risk_disclosure.htm*.

21. The presentation can be found at *https://www.naic.org/documents/cmte_c_climate_190412_attch_b.pdf?80*.

There is a need to review and evaluate climate models based on sound principles using comprehensive and rigorous standards. Climate models need to be validated using actual data. The assumptions of the models need to be identified and justified based on the appropriate peer-reviewed scientific literature, and limitations should be clearly identified. The principles and standards need to be developed by an independent nongovernmental body without conflicts of interest in order to have valid, meaningful and reliable models. The process should be nonpolitical and non-emotional, and it should follow scientific principles. The standards should have input from interested parties, but a separate body as described above should be required to ultimately determine the standards and how they will be used to evaluate climate models. An independent multidisciplinary team of scientists and other experts would be necessary to review each climate model in detail based on rigorously developed standards used to determine whether the model would produce unbiased and scientifically appropriate results. Climate models should not be calibrated after the fact to force-fit the desired result. Data should be justified as appropriate and made available for further scientific testing, and all assumptions should be identified and thoroughly explained. The computer code should be documented and should meet accepted software engineering practices, including security requirements, component design, changes to the model and version numbers.[22] State insurance regulators in the U.S. should take an active role and lead the world in promoting scientific inquiry.

VI. Loss Adjustment Process – Problems and Improvements

The catastrophe loss adjustment process has undergone many changes over time with the development of new technologies. Losses arising from catastrophes are unusual in that they tend to inundate the insurance system in ways that are difficult or impossible to prepare for in advance. For example, insurers cannot afford to employ the number of in-house catastrophe claims adjusters needed at the time of a major event. The best they can do is to enter into contracts with claims adjusting firms, but there is no guarantee that such adjusters will be trained to the level needed or that they will be able to deal with complexities and still adjust claims timely.

Loss Adjustment Following Hurricane Andrew

The catastrophe claims-paying process in 1992 was a manual one involving paper files, manuals, polaroid cameras and address books (St. John, 2019). Before

22. Although climate models are highly complex and incorporate numerous academic disciplines, a process such as that used by the Florida Commission on Hurricane Loss Projection Methodology can serve as a guide as to how to create a credible, scientific and unbiased process for complex model review. See *https://www.sbafla.com/Methodology/*.

Global Positioning System (GPS) units, adjusters faced a major challenge, even finding the location of a property when street signs were blown away. The magnitude of Hurricane Andrew's damage was unanticipated. The state of Florida's building codes were inconsistent and haphazard. Additionally, the state had not recognized the potential risk that it faced from a catastrophic hurricane.

Catastrophe Loss Settlement Today

Today, the situation has improved. Technology now provides for better communications to assist with advance alerts, improved ways to locate policyholders and their property, and digital tools to assist with reporting and settling of claims.

In reviewing the catastrophe claims settlement process, St. John (2019) described how during the last 20 years, the process has changed from one of paper to electronic processing. The resulting improvements have accelerated the time needed to settle claims. Insurers work around the clock after a disaster to settle claims by providing greater access for policyholders. Technology has made it possible to file claims online, many companies have created their own claims apps, and the telephone lines are monitored 24 hours a day, seven days a week. Companies are contacting policyholders if they suspect the policyholder has a claim. This type of aggressive action is possible because insurers can now take advantage of computer modeling, satellite imagery and the use of drones. Policyholders can use their smartphones to take pictures of their damaged property and, in some cases, save the expense of an adjuster having to examine the damage on-site. Insurance companies are also able to use drones to inspect roof damage instead of requiring an adjuster to climb up on a roof. What used to take weeks in settling claims is now done in a matter of a few days. Communications with email and text messages are also helpful, as well as the insurers' ability to electronically transfer loss settlement payments to a policyholder's bank account. According to St. John, the expectation for the future will be for claims to be processed quickly using virtual adjusting services and settled in a matter of hours.

Loss Creep

The term "loss creep" is a situation where losses after first reported unexpectedly deteriorate. (This may also be known as adverse loss development.) From an insurer's standpoint, loss creep can create problems with reinsurance coverage and may result in the insurer failing to have adequately booked sufficient loss reserves. If loss creep occurs as a result of excessive claims filed due to fraud or abuses of the legal system, the problem should be recognized and remedied by legislation if necessary. In the past, such problems have been found with claims associated with mold damage, sinkhole damage and water damage. From a loss adjustment perspective, insurers need to understand the type of claims they are

insuring, and after an event, they need to be able to reasonably estimate their obligations and liabilities.

According to a report by Gallin (2018), due to 2017 losses, Lloyd's of London experienced the problem of loss creep, which was found to be significant following Hurricanes Irma and Maria. The problem was also recognized as occurring in other parts of the world. Typhoon Jebi's initial losses in Japan were estimated at $13 billion, but the number was later raised to $15 billion. The reason for the loss creep may not be readily apparent. For Typhoon Jebi, Swiss Re found it necessary to increase loss reserves due to several reasons, including demand surge and business interruption losses. Swiss Re speculated that ongoing construction in anticipation of the 2020 Summer Olympics in Tokyo might have exacerbated the impact of Typhoon Jebi's loss totals. Another reason for loss creep could be the way insurers are using catastrophe models. The model that an insurer uses to evaluate its PML for solvency and reinsurance purchasing purposes may not be accurate at predicting the loss from single landfalling hurricane events (Aon Benfield, 2019). Some models may be more appropriate for some situations than others. There is also a concern raised by Robert Bentley of the reinsurance broker Guy Carpenter that catastrophe models need to be recalibrated to account for loss creep as well as climate change (Evans, 2019a). He notes that underwriting assumptions regarding global diversification are being reassessed and that virtually every major loss sustained in the last couple of years has involved loss creep.

Observations for the Future

Technology has been beneficial for the insurance industry in dealing with many types of claims. The speed of loss settlement has improved over time, but the overwhelming magnitude of catastrophic events will always result in complex problems and issues.[23] Too often, litigation is involved over a claim dispute.

The insurance consumer would benefit from more education, and the insurance system is also in need of simplification. One simplification idea could be to include special contract provisions to standardize the catastrophic loss settlement process. Also, laws should be revised to reduce the incentives for third parties to benefit from the system. After a loss settlement, additional data should be collected so that each part of the insurance premium dollar can be traced to how it was used and who benefited.

State insurance regulators, rating agencies, reinsurers and investors should be aware of which catastrophe models are being used by insurers and how they are using them as this could result in inadequate reserves. State insurance regulators may need to learn more about how insurers are using catastrophe models in estimating their losses and whether such usage is in any way contributing to the loss

23. O'Connor (2019) reports that more than 21,699 Hurricane Michael claims are still open, while 126,208 have been reported closed nine months following the storm. According to O'Connor, Commissioner Altmaier noted that the opened claims were a "discouraging statistic," and some open claims are either new or more difficult to close.

creep problem. Additionally, catastrophe modelers may need to examine whether loss creep is a factor that is unaccounted for in their models and, if so, what is the best way to incorporate it to accurately reflect future losses.

In addition to catastrophe modeling issues, loss adjustment expense (LAE) has recently surfaced as an area of concern. With improvements in technology, it would be reasonable to expect the cost of adjusting claims to have declined over time. However, this does not appear to be the case. During the 2019 Florida legislative session, there was significant concern about the recent increase in insurers' LAE related to catastrophe claims. As a result, legislation was passed[24] that increased the Florida Hurricane Catastrophe Fund's (FHCF) loss adjustment coverage for its participating insurers. In an era of technological advances, the insurance industry and its policyholders are not seeing cost savings due to other cost drivers. The overall level of LAE and how they are trending may need to be monitored and studied.

VII. Convergence of Alternative Capital with Traditional Reinsurance

The reinsurance market has been rapidly changing in recent years. ILS products, which include catastrophe bonds,[25] fully collateralized reinsurance,[26] sidecars[27] and other such products have evolved since the first catastrophe bond was issued in 1996 (Bhatia and Syroka, 2019).[28] A comprehensive listing of ILS products issued since their inception is provided by Artemis in its "Deal Directory." As of mid-year 2019, Artemis reported the issuance of $6.4 billion of new ILS products, bringing the total outstanding to $39.2 billion and total assets under management held by 51 managers to $103.2 billion (Artemis, 2019).

24. On June 18, 2019, Governor DeSantis signed HB 301, which increased the Florida Hurricane Catastrophe Fund's loss adjustment expense paid to their participating insurers from a flat 5% of reimbursable losses to a flat 10%. The effective date of the law was June 1, 2019. Source: Florida House of Representatives. See *https://www.myfloridahouse.gov/Sections/Bills/billsdetail.aspx?BillId=63195&SessionId=87*.

25. Catastrophe bonds are considered securities and require the setting up of a special purpose vehicle (SPV) using a reinsurance agreement with a counterparty or sponsor. For more details, see *https://www.artemis.bm/library/what-is-a-catastrophe-bond/*.

26. A reinsurance contract or program that is fully collateralized can be simpler to implement than catastrophe bonds for investors interested in ILS products. For more details, see *https://www.artemis.bm/glossary/collateralised-reinsurance/*.

27. A sidecar is a situation where a financial entity invests limited funds with a reinsurer used to take reinsurance risk. See Artemis for more details and examples at *https://www.artemis.bm/reinsurance-sidecars/*.

28. Bhatia, representing Raymond James and Associates, and Syroka, representing Fermat Capital Management, teamed up in developing their presentation for the FSU Future of Insurance Forum held on May 8, 2019.

The reinsurance markets have been evolving rapidly with alternative capital supporting ILS products to complement traditional reinsurance in recent years. Doherty (1997) discussed various innovations in the 1980s and 1990s, which included experiments with new instruments such as catastrophe bonds. Cummins (2008) provides market information on the early development of the ILS market. Although the ILS market has existed for 23 years, ILS products have now evolved to the point of providing similar terms and conditions to traditional reinsurance, and for some, risks and regions have been competitive based on price, especially during the last five to seven years. The expectation is that in the future, alternative capital will represent a larger and larger share of the total reinsurance market capital.[29]

ILS Market Investors

Large investors such as pension funds,[30] sovereign wealth funds, family offices and wealthy individuals (Bhatia and Syroka, 2019) are attracted to the ILS market since it involves securities with returns driven by insurance or reinsurance loss events considered to have a low correlation to financial market assets. As such, ILS products have the benefit of increasing potential returns for the same level of overall risk when added to an investment portfolio made up of stocks, bonds, real estate and other financial assets. From the insurance and reinsurance market standpoint, the diversification aspect offered by the ILS asset class can be beneficial in lowering prices and result in a more competitive and stable reinsurance market over time by tapping the deeper pockets of the capital markets.

Test of the ILS Market

Hurricane Katrina provided an early test for the resiliency of ILS products; however, the hurricane events of 2017 and 2018 were the latest test.[31] Insured losses in 2017 reached $140 billion, and insured losses in 2018 totaled $80 billion (I.I.I., 2019). Over these two years, insured losses totaled $220 billion. The ILS market was undeterred. The Artemis catastrophe bonds and ILS directory[32] indicate healthy issuance for the early part of 2019 and a market that is continuing to grow.

29. Detailed information on the ILS market is found on the Artemis website at *https://www.artemis.bm/*.

30. The State Board of Administration of Florida (SBA), which administers the Florida Retirement System, is the fifth largest public pension plan in the U.S. The SBA has invested $490 million in ILS products since January 2018. See State Board of Administration (2019).

31. Artemis reports catastrophe bond losses at *https://www.artemis.bm/cat-bond-losses/*.

32. See *https://www.artemis.bm/dashboard/catastrophe-bonds-ils-issued-and-outstanding-by-year/*.

Growing Exposure, Limited Reinsurance Capital and the Disaster Gap

In the future, due to exposure growth and increased demand for reinsurance, the ILS market will be needed to meet the growing demand that will exceed the traditional reinsurance market supply for some regions and risks (Seo, 2018). John Seo of Fermat Capital Management notes that in the largest peak risk zone, the U.S. coastal states have an exposure to hurricanes that has historically doubled every 10 years, while traditional reinsurance capital has increased only 33% in the same period. Thus, there is a growing "disaster gap" or a difference in insured and reinsured risk. According to Fermat Capital Management's research, the total global reinsurance capacity available for a single peril, such as hurricane risk in Florida, is limited to approximately $40 billion. A Category 5 hurricane directly hitting Miami could exceed $250 billion in insured losses, which illustrates the reinsurance industry is not adequately capitalized to withstand such an extreme event. Seo estimates that the underinsured risk has created a growing disaster gap exceeding $500 billion. The ILS market offers a solution since competitive pressures are not conducive to new reinsurer capital formation. Expectations are for ILS capital to gradually grow to and exceed $300 billion in the coming years.[33]

Bhatia and Syroka (2019) illustrate that the global dedicated reinsurance capital in 2017 was $432 billion, with $87 billion coming from the ILS market and $345 billion provided by traditional reinsurers. They estimate that in 2018, this number increased to $95 billion for ILS and remained at $345 billion for traditional reinsurance. They also estimate the compound annual growth rate of global reinsurance capital from 2012 to 2018 is 7.2% overall, with the ILS market growing at a compound annual growth rate of 38% over this period and with the traditional reinsurance market capital at only 3.4%. The $440 billion of global reinsurance capital will not be enough in the future, given the expected rapid growth of exposure. ILS capital will be more and more critical in the future to provide catastrophe protection. As the demand for catastrophe coverage grows, it will be difficult for traditional reinsurance capital to keep up given limited new capital formation within the sector.

Bhatia and Syroka (2019) point out that ILS capacity comes from the global capital markets, which dwarf the global reinsurance capital base; equity markets total more than $70 trillion, the global bond markets account for more than $92 trillion, and pension fund assets are more than $40 trillion globally. Compared to dedicated reinsurance capital of only $440 billion, the global capital markets represent a large potential source of future catastrophe risk capacity. The nature of the reinsurance industry is rapidly changing, and ILS market capital is expected to

33. See *https://www.artemis.bm/news/industry-leaders-on-what-can-drive-ils-to-300bn-beyond/*.

continue to grow in the future and will be needed to keep up with reinsurance demand.

Observations for the Future

State insurance regulators need to realize the dynamic changes going on in the reinsurance markets. Not only are ILS products playing a more prominent role in the overall reinsurance market, but more types of risk are using this alternative. Such risks would include coverages related to life insurance, mortgage insurance, floods, thunderstorms, winter storms, terrorism, medical claims, automobile third-party liability, wildfires, temperature risks, extreme mortality, lottery winnings and credit reinsurance (Artemis, 2019). The reinsurance market landscape is continuing to grow and evolve, and ILS products are positioned to provide additional coverage, as well as act as a stabilizing factor for the market.

VIII. Conclusions

Technological change along with strong competitive forces are transforming the insurance industry. Traditional insurers are being challenged by new start-up insurers, who are designing new business models to take advantage of inefficiencies to disrupt the traditional market. The future insurance industry workforce will need to be flexible and creative, continue their education, think broadly about the global business environment and prepare for rapid change.

The insurance regulatory system needs new measures to monitor insurer solvency for catastrophic losses. A supplementary methodology is needed that can identify and measure pockets of risk that have the potential to cause insolvencies if ignored.

Numerous legal cases have been filed seeking damages against parties that are deemed responsible for climate change. This type of litigation will affect risk management practices, the insurance industry, investors and consumers, and will have global economic considerations. Although the IPCC is viewed by many as the world authority on climate change, the various climate models that have been relied upon for determining global climate policy are being questioned. The NAIC may need to take an active role in establishing or supporting a scientific, transparent and unbiased review process for climate models rather than passively accepting the IPCC's recommendations and conclusions.

The catastrophic loss adjustment process has improved over time. Recent technology has streamlined the claims payment process; however, the volume of claims following disasters can still overwhelm insurance companies. Claims can be complicated, which leads to policyholder hardships and unnecessary lawsuits, underscoring the fact that the insurance system is complex and needs to be simplified. Although technology has benefited the catastrophe loss adjustment

process, other factors are causing overall loss adjustment expenses to increase for many insurers and reinsurers.

The ILS market is converging with the reinsurance market. The expectation for the future is that there will be a growing demand for reinsurance, and new capital will be needed. The ILS market has enormous potential, given that the financial markets represent deep pockets and are becoming more and more interested in the benefits that ILS products have to offer. State insurance regulators need to understand the importance of the role that the financial markets will play in capitalizing the insurance industry in the future.

Appendix A

InsurTech Start-Up Companies with Innovative Business Models

Friendsurance
Friendsurance is a type of peer-to-peer insurance broker whose objective is to make insurance more consumer-friendly. It has around 150,000 customers and operates as a digital broker involving 175 insurance companies. Friendsurance operates internationally out of Berlin, Germany, writing small groups of people consisting of generally 10 to 16 people who have some connection or know each other personally. At the end of their contract period, members of the group benefit from the money left over in the pool. Policyholders can receive up to 40% of their premium back if the group is claims-free. The larger the group, the higher the potential return of premiums. Thus, Friendsurance provides the incentive for the group to keep claims low in order to reduce its cost.

Besurance Corporation
Besurance Corporation offers a peer-to-peer risk-sharing platform that attempts to bring the concept of community back to insurance. The company's headquarters are in Calgary, in the Alberta Provence of Canada. It facilitates risk-sharing with software that serves as a tool for various community groups to employ for marketing, distributing the risk of loss and adjusting claims. The firm helps connect groups and assists people in creating their group, which can be open to the public or private. The idea is that an existing community can help control its claims and benefit from premiums being returned if there are no claims or if claims costs are low. Besurance uses actuarial software for rating, and claims are processed with the approval of community members.

Teambrella
Teambrella is a blockchain-based insurance platform that uses Ethereum smart contracts with headquarters in St. Petersburg, FL. Teambrella is a peer-to-peer network in which participants discuss each claim and vote to determine a consensus on whether a claim is covered. If a claim is approved, each participant shares a part of the premium with the participating member who has incurred the loss. The company's website states the following, "Not insurance. A lot better. You and your teammates cover each other. If you submit a claim within your team, your teammates pay it." The company describes itself as "a social app that is destined to replace insurance." In addition, it says, "Teambrella is what insurance has always strived to be: a tool for sharing risk with peers and helping those in need. But this time, we don't just declare the absence of conflicts of interest, we align interest of all parties and make the whole process provably fair."

Hippo Insurance

Hippo Insurance is an InsurTech company, reinsured by Topa Insurance, which is rated as A- by AM Best. The company's headquarters is in Mountain View, CA. Hippo's purpose is to change the way people purchase homeowners insurance. Additionally, it is able to assist with the purchase of flood coverage given its relationship with Neptune Insurance (Hurst, 2019). Hippo offers options for homeowners to cover their roof on either a replacement cost or actual value basis.[34] The company represents that its coverage is modernized by offering equipment or appliance breakdown coverage for items like home electronics and smart electronics appliances or devices. It also focuses on preventive measures by providing free water leak sensors with each policy, and it intends to add new preventive loss tools in the future. The application process is streamlined by providing an innovative way to backfill information automatically. It can provide a quote to potential customers online within 60 seconds, and its premiums are reported to be 25% lower than traditional insurers.

Additional InsurTechs

Haven Life, Sherpa Insurance, Pie Insurance, Neptune Insurance and Guevara Peer to Peer Car Insurance are other InsurTech start-ups. Although not discussed in detail, they represent other examples of disruptive insurers that operate in various lines of insurance in unique ways to compete with traditional insurers.

34. For a more detail review of Hippo's coverage see the following review: *https://simplyinsurance.com/hippo-insurance-review/#tab-con-4*.

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Cost Trends and Affordability of Automobile Insurance in the U.S.

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Abstract

We consider the affordability of auto insurance in light of recent increases in its cost. We show that increases in the cost of insurance are correlated with increases in the cost of losses, not with changes in insurer profits. We review the existing literature on the affordability of auto insurance and describe the inherent difficulties of evaluating affordability. We also highlight important limitations in the assumptions and methodologies used in past affordability studies. Finally, we conclude that rate regulation is not an appropriate tool for addressing the affordability of auto insurance.

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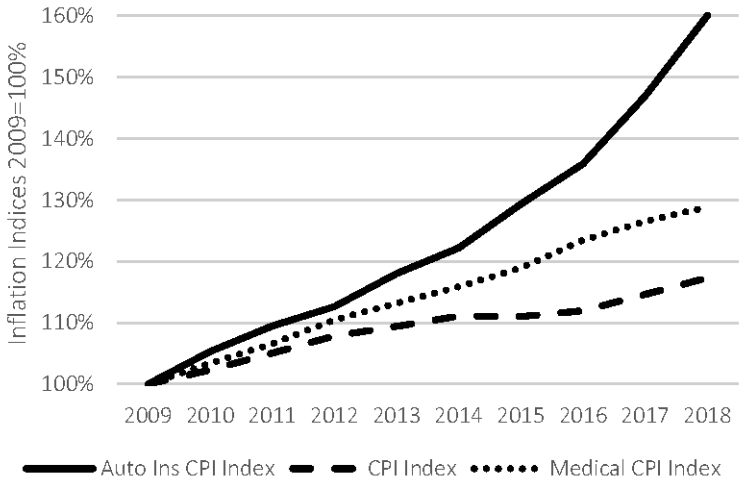
Introduction[1]

Automobile insurance represents a significant expense for some drivers in the U.S. In 2017, auto insurance premiums represent 12.6% of transportation expenses and just under 1.7% of total annual expenditures for low-income households. The cost of automobile insurance has increased from 2009 to 2018. Figure 1 shows that automobile insurance costs have risen faster than general inflation and medical inflation from 2009 through 2018. Hartwig et al. (2016) note that it is common for automobile insurance prices to decrease during a recession and increase quickly after. This may be caused by the correlations among driving, income and employment.

Figure 1: Automobile Insurance Inflation: 2009–2018



Source: Bureau of Labor Statistics

The increase in the cost of auto insurance relative to other goods and services motivates our study. We examine the factors driving cost increases and the effects of cost increases on affordability to determine if a public-policy response is appropriate and, if so, what an optimal response should involve. For example, if the rising cost of auto insurance coincides with windfall profits for insurance companies, enhanced rate regulation might be effective. If cost increases reflect increases in dangerous driving behavior or conditions, investments in law

1. The authors appreciate financial support from the Insurance Information Institute.

enforcement or transportation infrastructure would be more appropriate. If cost increases are caused by increases in underlying components of automobile insurance costs (e.g., automobile repair, medical care, and legal services), perhaps a practical solution would target these factors instead of insurance.

We also consider the affordability of auto insurance. We define an affordable good as one that is not too expensive for people of limited means to purchase. Given the importance of personal vehicles for transportation in many areas and the legal and moral imperatives for drivers to carry insurance, many people believe affordability of auto insurance for all income levels is an appropriate public-policy goal. However, Schmid (2014) notes that "… affordability is not a straightforward subject to study, nor does it have a uniform methodological framework." Thus, we review existing studies of auto insurance affordability and perform new analyses to inform policymakers on this topic.

As a preview of the results, we find that the cost of auto insurance has increased in recent years. We find that the recent increase in the cost of auto insurance is strongly correlated with increases in the frequency and severity of auto accidents. The increase in the frequency and severity of auto accidents is likely due to increases in the miles driven during a period of economic expansion. The evidence also points to distracted driving, the increasing cost of collision repair and medical cost inflation as contributing factors.

Some of the contributing factors, such as crash repair costs, should partially self-correct over time. Once a critical mass of the vehicle fleet has crash-avoidance technology, the reduction in loss frequency should offset at least part of the increase in loss severity. Other factors, like the cost of medical care and related non-economic damages (e.g., pain and suffering) might best be addressed by changes in personal injury protection (PIP) laws,[2] antifraud efforts,[3] transparency in medical pricing or civil justice reform. Legal and regulatory characteristics also affect the cost of insurance.

We find that the affordability of auto insurance is unrelated to the structure of auto insurance markets. Auto insurance markets are highly competitive, and insurer profits have not risen with the cost of automobile insurance. Specifically, we find no correlation between the cost of auto insurance and insurer profitability. Regulating rates in a highly competitive industry is not an appropriate tool for addressing affordability. In fact, there is considerable evidence that aggressive (i.e., rate suppressing) rate regulation reduces affordability. Weiss et al. (2010) find that when rate regulation suppresses cost for the riskiest insureds, average premiums, losses and injuries increase. Moreover, we note that the concept of affordability is at odds with the stated purpose of rate regulation—that rates should not be too low

2. PIP is a modified form of no-fault auto liability coverage. Generous PIP statutes in certain jurisdictions appear to be associated with higher insurance cost. Michigan just altered its generous PIP statute to allow customers to lower their premiums by choosing lower levels of benefits if they desire.

3. Hoyt, et al. (2006) show that several state laws reduce trends in auto insurance fraud.

(inadequate), too high (excessive) or unfairly discriminatory (based on something other than expected losses).

The remainder of the article proceeds as follows. In the second section, we describe factors affecting the cost of auto insurance. In the third section, we discuss strategies for reducing the cost of insurance. In the fourth section, we review and discuss the topic of insurance affordability. In the fifth section, we demonstrate the effects of flawed assumptions and analyses in several existing affordability studies. In the sixth section, we discuss the use of rate regulation to improve affordability. The final section summarizes our conclusions.

Factors Affecting the Cost of Insurance

Many factors can affect the cost of automobile insurance. We first examine whether changes in insurance prices are related to changes in the losses, expenses or profits of insurance companies. We then consider the underlying factors associated with changes in each category.

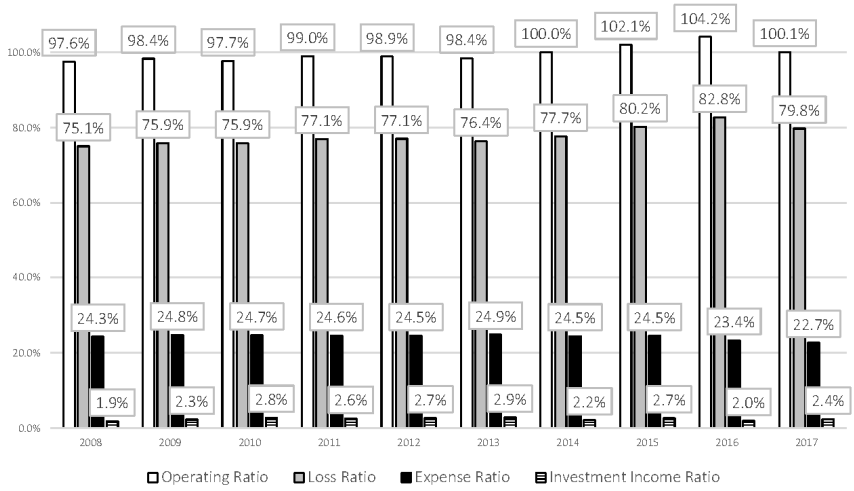
Automobile insurance pays for bodily injury and property damage resulting from the ownership and operation of automobiles. Payment is governed by policy forms and business practices that are enforced by state law. Thus, it covers legal defense in the event a driver is sued. In addition to payments made under insurance contracts, an insurer must cover its expenses, which include underwriting, loss adjustment, sales and marketing, taxes, and general overhead. The cost of automobile insurance must naturally reflect the costs of these goods and services. Expenses are offset by investment income earned on funds held as loss reserves and unearned premiums reserves and policyholders' surplus. Finally, the cost of insurance must include a profit margin that represents a return on capital commensurate with risk retained by insurers.

Figure 2 demonstrates changes over time in the losses, expenses, investment income and profits of the auto insurance industry. Each is shown as a percentage of net premiums earned. The loss ratio is the ratio of losses and loss expenses—incurred losses, loss adjustment expenses (LAE), and defense and cost containment expenses—to net premiums earned. The expense ratio is non-loss expenses—underwriting, general, marketing and tax expenses—to net premiums earned. The investment ratio is the return on investment funds attributable to insurance transactions to net premiums earned. The operating ratio represents overall insurer performance. It is calculated as losses plus expenses minus investment returns, divided by net premiums earned. An operating ratio greater than 100% indicates an operating loss, while a ratio of less than 100% indicates an operating gain.

All four ratios appear steady from 2008 to 2013. After 2013, the loss ratio increases (through 2016), and the expense ratio decreases. The increase in the loss ratio outweighs the decrease in the expense ratio, causing overall performance to weaken (i.e., the operating ratio increases above 100%). The last four years of the analysis (2014–2017) show zero or negative profit.In examining Figures 1 and 2, it is evident that while automobile insurance costs are steadily increasing over the time period examined, the profitability of auto insurers is not. In fact, the profits of auto

insurers are decreasing, suggesting that the increasing cost of auto insurance is likely not due to insurers extracting excess rents from consumers. We also see little change in investment returns.[4]

Figure 2: Operating Performance and Expense Categories Relative to Premium



Source: NAIC data sourced from S&P Market Intelligence
Notes: Operating ratio is losses plus expenses minus investment gains as a percentage of premium.

Next, we examine the correlations of the ratios. We find the correlation coefficient for the loss ratio and the operating ratio is 0.97. In addition, the correlation coefficient for the expense ratio and the operating ratio is –0.54 and the correlation coefficient for the investment income ratio and the operating ratio is –0.29. The correlations further suggest that losses are likely the root cause of rising insurance costs.

Several underlying factors are correlated with the increasing levels of auto insurance losses. These factors include: 1) the number of miles driven; 2) medical cost inflation; 3) the cost of repairing a vehicle; and 4) the prevalence of distracted driving.[5] We address each factor in turn.

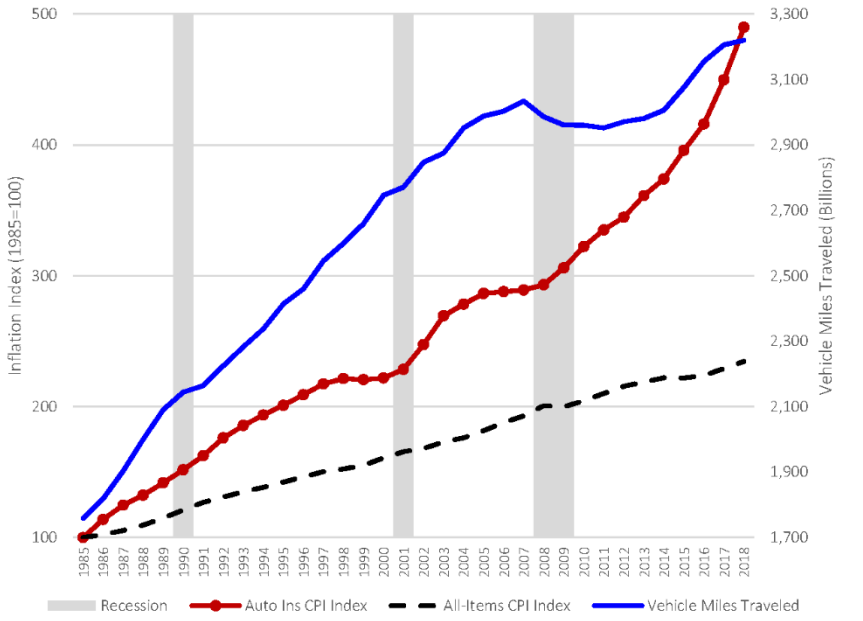
First, the number of miles driven has grown quickly as the economy expanded following the "Great Recession." Figure 3 shows the number of vehicle miles driven

4. Investment returns for the entire period considered in Figure 2 are at or near historical lows. The low interest rate environment likely increased pressure on insurers to raise auto insurance prices, but returns did not change.

5. There are many other factors—e.g., driving under the influence of alcohol and drugs, speeding, fraud and uninsured motorists—that affect the cost of auto insurance but do not change substantially during the study period.

annually from 1985 through June of 2018. The years in which the U.S. economy was in a recession are shaded in grey. The figure shows that vehicle miles traveled increases steadily from 1985 to 2006 and then drops from 2007 to 2009. Miles driven remain relatively flat from 2009 to 2013 and increases thereafter. Figure 3 also shows inflation—general inflation and auto insurance inflation—over the same time period. The correlation between auto insurance inflation and the number of miles driven is 0.92. It appears that the rate of auto insurance inflation decreases when economic recessions decrease the number of miles driven. During the time of sharp increase in auto insurance costs between 2011 and 2018, there is also an increase in miles driven as the U.S. economy rebounded from a recession.

Figure 3: Miles Driven and the Cost of Auto Insurance



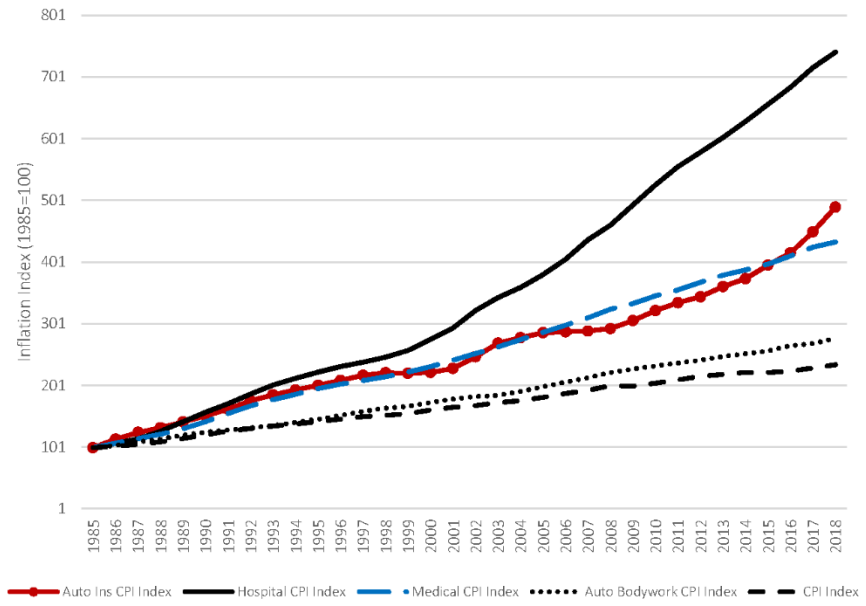
Sources: Bureau of Labor Statistics, National Bureau of Economic Research and U.S. Department of Transportation

Second, medical costs have grown over time. Figure 4 shows inflation indices for auto insurance, hospital services, medical services and auto bodywork from 1985 through 2018. The cost of automobile insurance is highly correlated with medical inflation (ρ=0.986). This correlation is noteworthy because only 32% of losses involve bodily injury.[6] Bodily injury losses are not divided proportionally across all

6. See Figure 6 below.

types of medical care. Therefore, it is possible that the types of medical care provided to crash victims face a systematically higher inflation rate than medical care in general. In fact, a large percentage of auto insurance injury claims involve hospital treatment, which has risen in cost much faster than other medical services.[7] Villaveces et al. (2013) find that vehicle crashes account for 2,765,900 emergency department visits in 2010. While one crash often sends more than one person to a hospital, the NAIC *Auto Insurance Database Report* only shows 1,715,569 bodily injury claims in 2010.[8] Another exacerbating factor is cost shifting, when medical providers charge private payers, such as auto insurers, inflated higher rates than they charge to other payers such as private health insurance, Medicaid and Medicare (IRC, 2010). Therefore, it seems auto insurers pay more than other payers for medical services because they incur relatively expensive types of medical services (e.g., hospital services), or they pay a higher price for the same services, or both.

Figure 4: Auto Insurance Inflation Components



Source: Bureau of Labor Statistics

7. This may be due, in part, to the variations in first-party coverages across states as some states, such as Michigan, have very generous first-party medical benefits. This is discussed more later in this section.

8. The NAIC *Auto Insurance Database Report* does not include claims frequency from Massachusetts or Texas.

Third, the cost of automobile collision repair has increased substantially from 1985 to 2018. The increase in the cost of automobile collision repair is due to the cost of new safety and efficiency technology available in vehicles. In recent years, automobile manufacturers have increased the use of special materials to improve fuel efficiency. For example, substituting aluminum for steel in the body of a vehicle can reduce the weight of a vehicle by up to 60% without compromising strength or durability. Several other materials have similar effects. However, these materials are more expensive to manufacture and install, sometimes requiring additional equipment and training. The percentage of claims involving special materials has grown from 3% in 2004 to nearly 20% in 2017 (Littooy, 2017a). This affects the cost of insurance because special materials increase the severity of property damage claims by an average of 15.7%.

Safety technology also affects claim severity. As manufacturers add sensors and cameras to help drivers avoid crashes, they add expense to repairs when these cars do crash. Littooy (2017b) finds that crash avoidance technology available in popular 2016 and 2017 model-year vehicles increases the average cost to repair front-end collision damage by 25% and rear-end collision damage by 10%, compared to the previous model year. While the average cost increase is substantial, the increase for certain vehicles is striking. For example, the cost of repairing a front-end crash on a 2016 Nissan Maxima increased by 132% (from $2,915 to $6,752) compared to the previous model year, which did not offer front-end collision avoidance sensors. Similarly, the cost of repairing a rear-end collision on a 2016 Toyota Prius increased by 75% (from $1,969 to $3,452) compared to the 2015 model.

Importantly, it is beyond the scope of this study to pass judgment on the use of special materials or safety features. Both offer value to consumers and society. Nonetheless, discussion of auto insurance costs is not complete without including these topics.

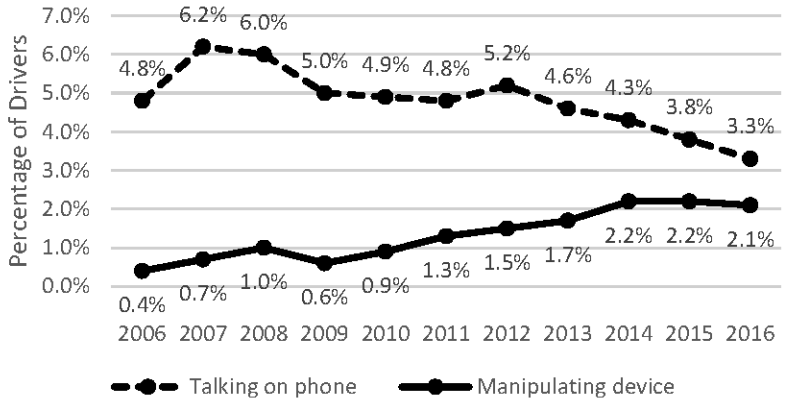
Fourth, distracted driving continues to be a problem. Figure 5 shows the percentage of drivers on the road at any given moment during a day who are talking on a cell phone or using an electronic device. The estimated total number of drivers at a given moment is 14,582,790. Thus, in 2016, there were (14,582,790×3.3%=) 481,232 drivers talking on cell phones at any given moment. While the percentage of drivers talking on cell phones when driving is trending downward, the percentage of drivers manipulating a mobile electronic device is rising. Given that young drivers are most likely to use mobile devices while driving, it is possible this problem will worsen over time if youth signals a new paradigm of electronic device habits, rather than lack of maturity or experience.

Reducing the Cost of Auto Insurance

There are many potential strategies for reducing the cost of auto insurance. Seatbelts and airbags reduce the severity of bodily injury losses but do nothing to limit the frequency of accidents. Antilock brakes, lane sensors, blind spot monitors

and collision avoidance systems reduce loss frequency but increase property damage severity. Improving road infrastructure (e.g., installing roundabouts, widening lanes and reducing speed limits) can reduce loss frequency and severity, but it is expensive and can be politically challenging. Considering the tradeoffs involved in any given strategy is crucial to successful public policy.

Figure 5: Electronic Device Usage While Driving



Source: Pickrell and Li, 2017

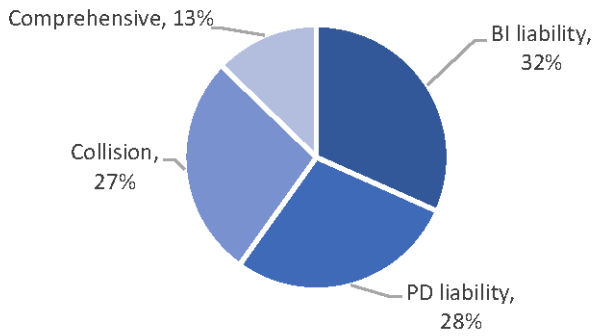
Figure 6 shows the breakdown of insurance losses by type of coverage in 2017. Bodily injury losses are 32% of total losses, and property damage losses are 68%. However, within the category of liability insurance—the only mandatory coverage—bodily injury losses are 53%, with property damage representing the remaining 47%. Thus, efforts to reduce property losses might have the largest overall effect, but a reduction in bodily injury costs would give the greatest relief for mandatory coverage. This difference is important because purchase requirements are cited frequently in calls to address affordability (FIO, 2017).

Figure 7 demonstrates the effects of frequency and severity on changes in loss costs by the type of coverage. Data are available for five types of coverage: 1) collision; 2) comprehensive; 3) property damage liability; 4) bodily injury liability; and 5) PIP coverage.[9] Collision insurance covers damage to the insured's automobile when it overturns or collides with another object. Comprehensive coverage generally pays for damage to the insured's automobile that occurs when it is not being driven. Examples include theft, fire, flood and vandalism. Property damage liability coverage pays for damage to a third party's property for which the insured is legally liable. Bodily injury liability coverage pays for bodily injury to a

9. Data are not available for uninsured and underinsured motorist coverage.

third party for which the insured is legally liable. In states with PIP laws, PIP coverage pays for bodily injury sustained by the insured, regardless of fault, up to a specified threshold.

Figure 6: Auto Insurance Losses by Coverage Type



Source: NAIC data from S&P Global Intelligence and ISO Fast Track Circular
Notes: "BI liability" is liability insurance for bodily injury. It includes PIP losses, which are approximately half of all bodily injury losses in states where PIP is mandatory. "PD liability" is liability insurance for property damage. "Collision" and "comprehensive" are first-party property coverage. Total amounts for liability and first-party property are from the NAIC. The finer categories are set using pure premium estimates from ISO Fast Track.

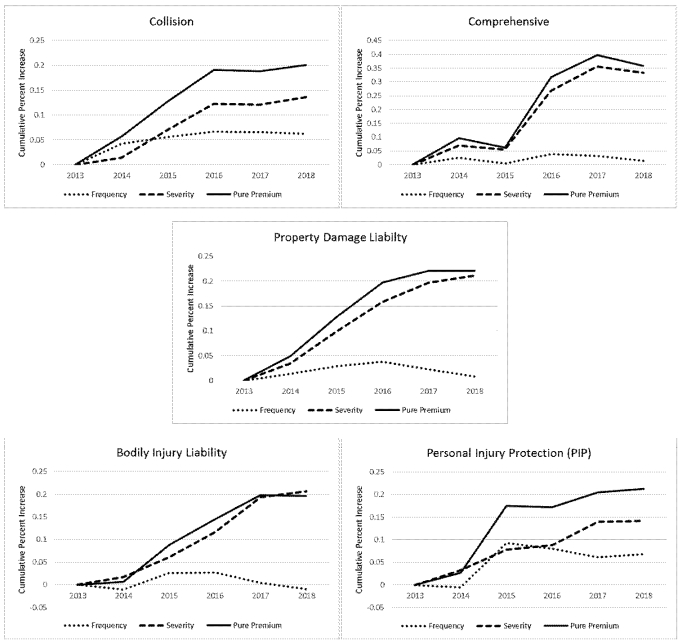
In Figure 7, we see a few common patterns. For each coverage type, loss severity increases sharply from 2013 through 2016 and then levels off through 2018. For collision and PIP coverage, loss frequency increases early and levels off at a new higher rate around 2016. For the other coverages, frequency increases but trends back to 2013 levels by 2018. These patterns can be instructive for policymakers. For example, PIP coverage exhibits large increases in frequency and severity of loss (in contrast to the stated intent of PIP). It seems clear that eliminating PIP laws in states where they exist could reduce the cost of auto insurance.[10] The cost of bodily injury liability coverage is driven by claim severity, rather than frequency, in recent years. This observation suggests efforts to reduce medical costs could be effective in reducing auto insurance premiums.

Because insurance markets are competitive and average profits are thin, it is not logical to address the cost increases with rate regulation. Likewise, efforts to reduce property loss severity are ill-advised because they are likely to involve making cars

10. A large literature concurs that PIP increases the cost of auto insurance. Incentives created by the PIP systems cause increased costs. Therefore, eliminating PIP would not simply shift this expense to other coverages in the policy. See Derrig et al. (1994), Harrington (1994), Cole et al. (2004), Anderson et al. (2010), PARI (2012) and others.

either less safe or less fuel-efficient. However, Karl and Nyce (2019) find that laws limiting the use of handheld cell phones while driving—even when enforcement is limited—reduce auto insurance losses and premiums. Efforts to further pass, strengthen and enforce these laws have the potential to reduce loss frequency in each coverage category.

Figure 7: Changes in Frequency, Severity and Pure Premium by Coverage, 2013–2018



Source: ISO Fast Track data
Notes: Each graph shows the cumulative percentage change compared to base year 2013. Data for 2018 only reflect the first six months of the year.

Civil justice reform can potentially reduce the severity of bodily injury losses in liability and PIP claims. Legislation that reduces incentives to inflate claims in a PIP system, or reduces the amount available to plaintiffs as non-economic damages (e.g., pain and suffering) in the liability system, can reduce the cost of insurance (Grace and Leverty, 2013).

Auto Insurance Affordability

Low-cost transportation enhances consumers' standard of living by reducing the cost of nearly everything in the economy. Low-cost transportation also expands opportunities, such as access to employers and the choice of employers. Transportation in America is synonymous with automobiles, and American consumers' preference for traveling in their automobiles has only increased over time. The auto's share of work trips has climbed from 72.5% in 1960 to 90% in 2009 (Winston, 2013). The Bureau of Economic Analysis reports that Americans spent $1.33 trillion on gasoline and vehicles in 2018.

Because a vast majority of Americans rely on automobiles for their transportation and transportation often determines a consumer's economic opportunities, the affordability of driving has received expanded attention of late. This recent attention has mostly focused on one component of the cost of automobile transportation, automobile insurance and, in particular, on whether automobile insurance has become less affordable for different segments of the population. Total net premiums written in 2018 on private passenger automobile insurance in the U.S. was $242.7 billion ($145.8 billion for liability insurance and $96.9 billion for collision/comprehensive insurance; Source: NAIC data). Thus, total premiums on personal automobile insurance in 2018 are 10.93 percent of the $1.33 trillion spent on gasoline and vehicles.

As driving increases, the cost of auto insurance increases. More cars on the road increase the probability of accidents. More miles driven also increase the probability of accidents. The cost of auto insurance has increased at the same time that driving has increased.

Existing Affordability Studies

All states require a driver or owner of an automobile to have liability insurance or financial security that may be satisfied by auto liability insurance (Insurance Information Institute, 2016) as a condition for registering and driving a car. As such, automobile insurance, and specifically, the affordability of automobile insurance, has been the source of a great deal of research. However, the existing literature on auto insurance affordability is diverse (Harrington, 2002; Tennyson, 2012), and there is little consensus on a single method of defining affordability given available data (Hartwig et al., 2014). Our paper does not try to fill this void. Instead, we discuss how the assumptions made in prior studies lead to their conclusions. We also show that some common assumptions are flawed.

A number of recent studies attempt to examine the affordability of auto insurance. These studies measure the cost burden on an auto owner of having to buy auto insurance by using an income approach—comparing expenditures on auto insurance to income. According to this approach, auto insurance is assumed to become unaffordable when the cost burden becomes excessive relative to income. Although a lower insurance premium is obviously more affordable than a high

premium, no obvious threshold separates affordable premiums from unaffordable premiums and thus defines affordability.

There are two types of studies that examine the affordability of auto insurance. The first style of study makes an arbitrary judgment of what constitutes affordability. The most notable study of the first variety is the *Study on the Affordability of Personal Automobile Insurance* by the Federal Insurance Office (FIO, 2017). The FIO endeavored to study the extent to which traditionally underserved communities and consumers, minorities, and low- and moderate-income (LMI) persons have access to affordable automobile insurance. The FIO calculated an auto insurance affordability index at the ZIP Code tabulation area level. The affordability index is defined as the ratio of the average annual written premium in personal automobile liability in the voluntary insurance market to the median household income (based on U.S. Census Bureau data) in a ZIP Code. The FIO did not study all ZIP Codes; rather it limited its analysis to ZIP Codes in which Affected Persons (AP) were 50% or more of the population. AP is defined as low to moderate income and majority-minority ZIP Codes.[11] AP ZIP Codes represent 28% of all ZIP Codes nationwide.

The FIO defined personal auto insurance in a ZIP Code as "unaffordable" if its affordability index is equal to or greater than 2%. The FIO selected this threshold because the 2013 and 2015 versions of the Bureau of Labor Statistics' Consumer Expenditure Survey found that the average consumer in the U.S. spent about 2% of average income (after taxes) on vehicle insurance. The FIO determined that nationwide, there were 845 AP ZIP Codes with an affordability index value above 2%. These 845 ZIP Codes represent 9.2% of the 9,172 AP ZIP Codes and 2.6% of the 32,452 ZIP Codes nationwide (at the time of the FIO study). The total population in the 845 AP ZIP Codes is approximately 18.6 million.

There are several weaknesses with the FIO's approach. First, the threshold for "unaffordable" is arbitrary. There is no economic justification for selecting a 2% threshold. Second, a definition of "unaffordable" that is relative to a national average will always deem auto insurance as unaffordable for some ZIP Codes. For example, if the auto insurance expenditure to income ratio is normally distributed with a mean of 2%, then the FIO definition will always deem 50% of ZIP Codes "unaffordable" and the other 50% as "affordable," regardless of the magnitude of the premium. With this definition, premiums could uniformly drop by 30% in all ZIP Codes, and 50% of ZIP Codes will still be classified as "unaffordable" and the other 50% as "affordable."

11. The FIO defines a ZIP Code as "majority-minority" if the minority population ("Black American, Native American, Hispanic American or Asian American") in a ZIP Code exceeds 50% of the total population of that ZIP Code. A ZIP Code is "low-income" if it has a median family income less than 50% of the median income of the Metropolitan Statistical Area (MSA) for that ZIP Code. A ZIP Code is "moderate-income" if the ZIP Code has a median family income between 50% and 80% of the MSA median income.

Third, the FIO and consumer advocate groups use the findings to suggest that APs are unfairly harmed by high auto insurance premiums.[12] The study, however, does not compare AP ZIP Codes with non-AP ZIP Codes, making it impossible to draw such conclusions.

Fourth, the FIO correctly acknowledges a limitation of its approach: "The affordability index allows for comparison of ZIP Codes within the same state, but should not be considered for interstate analysis." Interstate comparisons are inappropriate because there are wide variations among states in terms of laws (e.g., required financial responsibility limits[13] or state mandates for PIP coverage), medical utilization rates, fraud, regulations and policies (e.g., state programs that offer low-cost auto liability insurance or help low-income and other drivers obtain more affordable auto insurance; health and safety measures such as highway safety initiatives). The FIO, however, does not acknowledge that these variations also influence the national average of auto insurance expenditure to income ratio, which determines its threshold for "unaffordability."

To avoid the inherent subjectivity involved in ascribing a specific threshold at which auto insurance is judged unaffordable, the second style of auto insurance affordability study examines how the ratio of auto insurance expenditure to income varies over time. There are three recent studies of this style (Schmid, 2014; Insurance Research Council, 2015; and Brobeck and Hunter, 2015). Schmid (2014) finds a gradual improvement in auto insurance affordability from the 1990s to the 2000s. The Insurance Research Council (IRC) study finds that the average U.S. consumer spends about 1.5% to 1.6% of his or her income on auto insurance. It also finds that the expenditure-to-income ratios are similar for individuals in the two lowest income quintiles (which the report defines as LMI consumers). Moreover, the study finds that auto insurance has become more affordable over time—from the 1990s to the mid-2010s. Brobeck and Hunter (2015) reach a conclusion different from the other two studies. Using different methods and data than the other two studies, they conclude that auto insurance affordability has not changed over time for moderate-income households (second income quintile) and has worsened for low-income households (first income quintile).

While this style of study represents a slight improvement over studies evaluating levels of an affordability ratio, it still lacks a foundation for determining if a given ratio of premium to income is "affordable." For example, if the cost of insurance in a given jurisdiction is very affordable in year one, and then it increases for 10 years in a row, it could still be affordable in year 10. Moreover, none of these studies control for the availability and cost of alternative forms of transportation. If other forms of transportation are available, the importance of affordability of auto insurance decreases.

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12. See for example, *https://consumerfed.org/press_release/new-treasury-dept-report-reveals-18-million-americans-live-zip-codes-auto-insurance-unaffordable/*.

13. The 2018 Automobile Financial Responsibility Laws by State: *https://www.iii.org/automobile-financial-responsibility-laws-by-state*.

Analysis of Affordability

In this section, we analyze auto insurance cost and affordability while being mindful of the criticisms of the existing studies mentioned above. We begin by observing levels and trends in the cost of auto insurance and its relation to income. Next, we repeat the FIO (2017) analysis, but we control for one additional factor, the availability of alternative transportation (AT). This step highlights the downside of the FIO's over-simplified analysis. The purpose of this section is to show how reasonable changes in assumptions regarding the definition of income can lead to different conclusions about the level of affordability.

Income and Affordability

From the consumer's point of view, there are two ways of looking at auto insurance premiums. The first is the absolute dollar cost, and the second is the relative amount spent compared to other items in the consumer's budget.

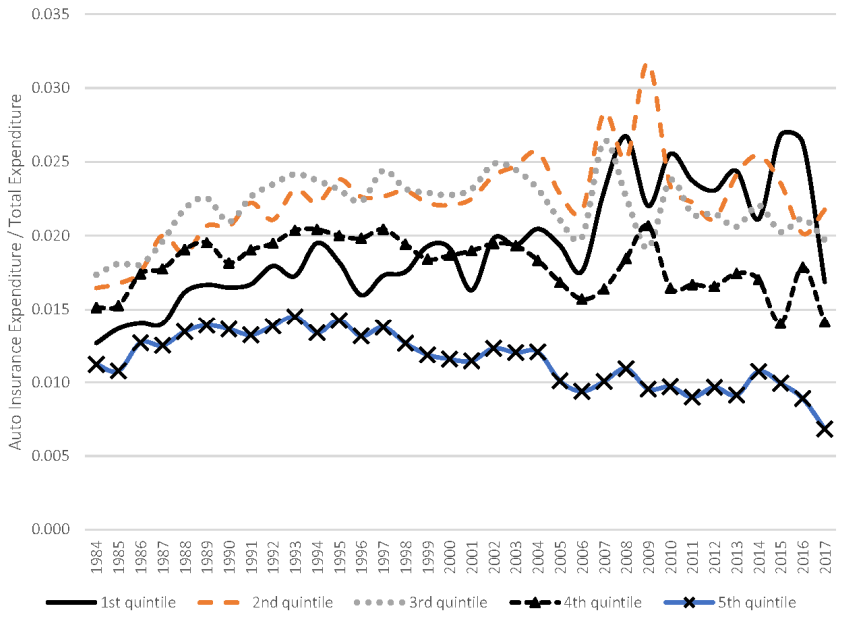
In Figure 8, we look at auto insurance expenditures as a percentage of total expenditures or pre-tax income [insurance premiums / (maximum of total expenditures or pre-tax income)]. Our measure differs from existing studies, which consider the ratio of insurance premiums to pre-tax income in each income quintile (e.g., Brobeck and Hunter, 2015; and Schmid, 2014). Insurance expense to total expenditures is the better measure of affordability because it recognizes spending from retirement savings and income from some public sources (e.g., housing assistance) to people in the first three income quintiles, whose total expenditures exceed total pre-tax money income.

Note that after controlling for expenditures, auto insurance is more affordable for the first income quintile than for the next three quintiles from 1984 through 2003. In the following years (2004–2018), the average ratio increases for the lower three quintiles, but there is still substantial overlap across these three income groups. In 2018, the ratio was lower for the first quintile than for quintiles two and three.[14]

In contrast to results presented in other studies, we see that the measure of premium relative to available resources is stable for most consumers across income quintiles. For the upper-income quintile, we see that the percentage of income spent on auto insurance is relatively stable at around 1%. While auto insurance premiums as a percentage of total expenditure did increase for the first three income quintiles around 2006, the post-2006 trend for this affordability measure is decreasing for each income quintile. This reinforces the notion that premiums are volatile as they must cover the costs of policyholders' losses. The costs to cover injuries and to repair and replace damaged property are also volatile, and this is seen in how expenditures change over time.

14. The types and amount of coverage purchased may vary by income. To the extent that individuals in the lower quintiles have lower limits or less coverage, the primary concern may not be affordability of coverage but the adequacy of coverage. However, an in-depth discussion of this issue is beyond the scope of this paper.

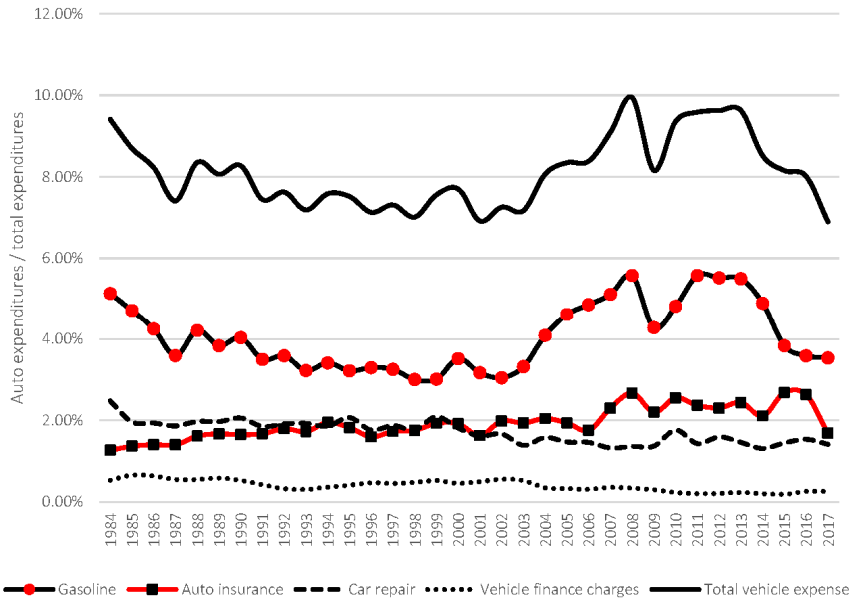
Figure 8: Relative Auto Insurance Expenditures by Income Quintile



Source: Consumer Expenditure Survey from *https://www.bls.gov*
Note: The denominator is the greater of total expenditures and pre-tax money income. For the first three income quintiles, total expenditures are greater than pre-tax income.

Figure 9 shows the expenditures typically related to automobile ownership divided by total expenditures over time for those in the first income quintile. Auto insurance is just one component of the cost of driving. Figure 9 shows all the costs of auto ownership, which include insurance, gas, repairs and financing. Overall, the cost of gasoline is the highest expenditure component of the cost of driving and the cause of most of the volatility in the cost of driving. But for volatility in the price of gasoline, the cost of driving would be remarkably stable over time. Vehicle repair and maintenance and auto insurance are the second and third largest expenditures. Currently, auto insurance takes up a greater proportion of a consumer's budget than auto repair and maintenance, but that was not always the case. Finance charges have been especially low in recent years, reflecting the low-interest rate environment. Given that the cost of auto insurance is not the only—or even the largest—cost associated with driving, it is not logical to suggest that auto insurance is unaffordable when it is greater than X% of income, yet the total cost of operating a car is often much higher than X%. Even if auto insurance were free, the cost of transportation would fluctuate over time by more than 2% of income for consumers in the first quintile.

Figure 9: Vehicle Expenses for First Income Quintile



Source: Consumer Expenditure Survey from *https://www.bls.gov*

Affordability Over Time

Figure 9 shows that the cost of automobile ownership changes over time. An interesting question is whether we can accurately evaluate affordability over time when both the cost *and the value* of a good changes. This question is especially relevant to automobile expenses as technology has greatly enhanced the safety profile of automobiles over time. For example, the Insurance Institute for Highway Safety (IIHS) crashed a 1959 Chevrolet Bel Air into a 2009 Chevy Malibu to compare their safety profiles. Both of the sedans were popular at the time of their manufacture. The results were dramatic. The driver of the Bel Air would have suffered severe injuries, while the driver of the modern car would have suffered minor, if any, injuries.[15] Modern cars provide transportation services like older cars, but they do so at a lower expected cost of injury or death. Such technology is costly, thereby increasing the cost of insurance. However, we cannot conclude that auto insurance has become less affordable unless we can simultaneously adjust the value

15. See *https://www.youtube.com/watch?v=fPF4fBGNK0U* for a Consumer Reports video and short commentary on this test.

of transportation to reflect changes in safety. Therefore, we must exercise caution, even when evaluating affordability based on changes in cost over time.

Alternative Transportation Analysis

The availability and cost of AT is an important factor when considering the affordability of automobile insurance. Examples of AT include public transportation, telecommuting, ridesharing, livery services (e.g., taxi or ride-hailing service), delivery services and walking communities. Although AT does not necessarily change the affordability of insurance, when alternative modes of transportation are available, the cost of driving, including the cost of automobile insurance, becomes less important as a public-policy issue.

The aforementioned FIO study (FIO, 2017) attempts to estimate the number of people in low to moderate income and majority-minority communities that do not have access to affordable automobile insurance. While we have a host of concerns about the nature and execution of the FIO analysis, it represents one example of a public effort to measure the affordability of auto insurance in these communities. As such, it can serve as a useful baseline analysis to which we can compare alternative specifications.

The FIO (2017) notes that driving one's own vehicle provides advantages over public transit in many locations. Specifically, the FIO claims there are many jobs that low-income people cannot reach via public transit within 90 minutes. However, there are many places where people do ride public transit, walk or ride a bicycle to work. In such places, the affordability of auto insurance is less important than in places where an automobile is necessary for employment. Rather than dismiss these possibilities, we measure the effect of alternative transportation on the results from the FIO (2017) analysis.

We begin with the data and results provided by the FIO (2017).[16] These data identify ZIP Codes in which a majority of people are minorities or low-to-moderate income. Residents of these ZIP Codes are labeled AP. They also provide the ratio of average auto insurance premium to median income, called the affordability index (AI). If the AI in an AP ZIP Code is greater than 2%, the ZIP Code is labeled an AI ZIP Code. We merge these ZIP Code level data with variables from the 2015 American Community Survey describing the population and commuting habits of workers by ZIP Code.[17] For each ZIP Code, we calculate the number and percentage of workers who commute to work using an alternative form of transportation.

We use two measures to capture the effects of AT on affordability. The first is the percentage of workers who use AT. People who use AT obviously have access to AT. We then reduce the population of people in AI ZIP Codes by the percentage of workers using AT.

16. The spreadsheet is available from *www.treasury.gov/initiatives/fio/reports-and-notices/documents/final data for 2016 fio us auto affordability analysis.xlsx*.

17. It is not clear which population estimate the FIO uses in its study. Our results using 2015 ACS population data are very similar, but not identical, to results in the FIO study. We do not expect this difference to bias results.

The second measure recognizes that AT may be available as a substitute for driving, even for people who do not use it currently. We assume that if 25% of workers in a ZIP Code use AT to commute to work, it is available to everyone in the ZIP Code. We drop these ZIP Codes from the sample and recalculate the number and population of AI ZIP Codes.

Table 1 presents the results of these analyses. In the first AT scenario, the estimated number of people struggling to afford auto insurance drops by 31% (from 18,859,649 to 12,992,220). This estimate represents 4.1% of the U.S. population, in contrast to 5.1% in the FOI (2017) analysis. As expected, our second AT adjustment has a larger effect. When we exclude ZIP Codes where at least 25%[18] of residents commute to work via AT, the estimate of AI population drops to 9,638,546, or 3% of the U.S. population.

Table 1: Results of Affordability Analysis with Alternative Transportation

Population	# U.S. Zip Codes	% U.S. Zip Codes	% AP Zip Codes	Total Population (1,000s)	% U.S. Population	% AP Population
Total U.S.	32,989	100%	N/A	320,084	100%	N/A
AP Zip Codes	9,172	28%	100%	112,801	35%	100%
AI Zip Codes	845	2.6%	9.2%	18,860	5.9%	16.7%
AI Zip Codes, Population not using AT	845	2.6%	9.2%	12,992	4.1%	11.5%
AI Zip, AT Unavailable	564	1.7%	6.1%	9,639	3.0%	8.5%

Sources: FIO (2017) and 2015 American Community Survey (5-year estimates)
Notes: ZIP Codes are actually Zip Code Tabulation Areas (ZCTA). AP ZIP Codes have a majority of residents who are minorities or low-to-moderate income. AT is alternative transportation. Population not using AT indicates AI ZIP Code populations are reduced by the percentage of workers using AT. AT unavailable indicates the populations of AI ZIP Codes are omitted with at least 25% of workers using AT.

While this affordability estimate shares nearly all of the flaws in the FOI's (2017) estimate, our analysis indicates that it is important to consider the availability of alternative transportation—and potentially other factors—when attempting to measure the affordability of auto insurance.[19]

18. The 25% cutoff is necessarily arbitrary. Increasing or decreasing this limit would probably affect results, but not the conclusions.

19. Alternative transportation may be used by those in densely populated areas because it is a more efficient mode of transportation. It could also be less expensive when you consider commuting costs, including the cost of parking in some areas.

Addressing Affordability with Rate Regulation

The current focus on affordability is only the latest manifestation of the recurring concern that auto insurance premiums are "too high" and must be reined in with regulation. Thus, policymakers may be encouraged or tempted to consider regulation as a solution to any perceived affordability problem. Unlike affordability, which has no objective definition, there is a long legal history of what constitutes proper insurance rates. This includes a constitutionally mandated fair rate of return for insurers. However, even with such legal and constitutional protections, regulatory rate suppression has caused market disruptions in several states.

Historically, rate regulation was designed to make sure that rates were adequate (to prevent insolvency), not excessive (to prevent potential abuse of market power) and statistically related to losses (to ensure fairness). If rates are inadequate, we would see firms leaving the market. Prices (whether regulated or market-based) would have to rise for insurers to enter. In contrast, if rates were excessive, we would see increasing numbers of firms entering a state market. If significant entry occurs, competition would naturally start to diminish premiums. Further, if premiums were unrelated to losses, firms would not be able to demonstrate compliance. Without a link to losses, rates would be arbitrary, and economic incentives would encourage firms to relate prices to costs in order to survive. All three of these constraints (along with the corresponding market incentives) keep rates where they belong. One should not overlook the strong incentives that entry and exit have in a competitive insurance market as these forces keep product prices in line with loss costs.

If state insurance regulators decide that auto insurance prices are "unaffordable" and put an arbitrary limit on premiums that are related to an insured's income, then insurers will exit the market rather than write coverage at a loss. History offers several examples of what happens when state insurance regulators suppress rates for the riskiest insureds.[20] In Massachusettes, strict regulation reduced the number of insurers in the state (Tennyson, Weiss and Regan 2002). In New Jersey (Worrall, 2002) and South Carolina (Grace and Klein, 2002), firms left the market due to strict price regulation in auto insurance, and the price of auto insurance increased. Finally, the Florida homeowners insurance market has gone through ups and downs as the state has restricted the ability of homeowner insurers to make a fair return over time. All of these policies were enacted to improve the "affordability" of insurance for high-risk drivers or homeowners. The result in every case was a failed market with fewer firms, higher prices and upset voters.[21]

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20. In addition to limiting rates, state insurance regulators in some states restrict the use of certain rating variables, such as credit-based insurance scores, to address affordability. Restricting the use of an accurate rating factor and capping accurate insurance rates have similar effects on insurance markets.

21. Born et al. (2018) find that "under 'normal circumstances,' insurers find ways to work around or ameliorate the effects of tight constraints on their rates and/or long delays in getting them approved." This suggests that the effects of rate regulation may be somewhat muted in some markets.

Despite the difficulties we describe in defining and measuring affordability, if lawmakers believe that automobile insurance is not affordable, there are public-policy alternatives to rate regulation that are better suited to address this potential problem. For example, a means-tested subsidy funded by a broad tax base would minimize the dangerous incentive effects of cross subsidies.

Finally, there is a large body of academic research that finds automobile insurance markets do not need rate regulation to function efficiently (see e.g., Tennyson, 2012; Tennyson, 2013; and Schwarz, 2018). In fact, a vast majority of this research indicates that auto insurance markets without rate regulation perform better on a wide range of measures than auto insurance markets with rate regulation (see e.g., Cummins, 2002). There is also considerable evidence that when rate regulation suppresses costs for the riskiest insureds, average premiums, losses and injuries increase (Weiss, et al., 2010). In sum, because insurance markets are competitive, average profits are thin and cross subsidies increase average losses through risk-taking incentives, it is not logical to address cost increases with rate regulation.

Conclusions

Auto insurance premiums increased in nominal terms from 1985 to 2018. The rate of inflation has increased in recent years as the economy recovers from the "Great Recession" and the volume of miles driven returns to familiar levels. Other likely causes of cost increases include increasing levels of distracted driving and the cost of repairing vehicle features that improve crash safety and fuel efficiency. While premiums are increasing, we show that they are correlated with the underlying costs of paying for expected losses, such as the costs of medical, hospital and auto repair services. Our results suggest that the inputs to the cost of covering losses are increasing over time, and profit levels are steady or decreasing. Thus, the pressure on auto insurance premiums is not likely due to changes in insurers' profit expectations or their ability to set prices.

Given the inherent difficulties in measuring affordability that we discuss above, we are not able to determine definitively if auto insurance is affordable. However, we show that flawed assumptions related to common affordability measures have large effects on the results and conclusions of other studies. We find that insurance premium to income ratios are relatively stable over time. We also find these ratios are not driven by insurer profits.

We show that the ratio of auto insurance cost to pre-tax income—a common measure of affordability in other studies—is biased because income does not include spending one's retirement savings or student loan proceeds. By analyzing the ratio of insurance premium to total expenditures, rather than pre-tax income, we find that auto insurance affordability measures for people in the lowest income quintiles are significantly overstated.

We point out that auto insurance is only one (relatively small) piece of the total cost of transportation. In fact, it is possible for driving to be "unaffordable" (albeit by an arbitrary classification), even if auto insurance were free, highlighting the

importance of a properly framed research question. Likewise, we show that controlling for the availability of alternative transportation has a substantial effect on results from existing studies of auto insurance affordability.

Finally, we conclude that insurance rate regulation is not an appropriate public-policy tool to address affordability. Auto insurance is a necessity for many, but to shift prices based on an arbitrary income benchmark will cause a major disruption to insurance markets, raising prices for all insureds. In the recent past, attempts to improve "affordability" by reducing prices for the highest-risk drivers have shown poor results (Worrall, 2002). Such actions create incentives to take more risk because high-risk drivers do not internalize the cost of risk by paying risk-based premiums.

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Social Media Liability Exposures

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Abstract

This article is the first in a two-part series. Part I discusses the rise of social media use and the corresponding increase in liability exposures for individuals and businesses. Part II discusses coverage issues that arise from such exposures under comprehensive general liability (CGL) and homeowners policies.

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I. Introduction

In February 2013, reports estimated that by the end of 2013, approximately 2.7 billion people worldwide would be using the internet.[1] Just five years later, as of December 2018, that number has risen to over 4.1 billion internet users in the world.[2] The exponential growth of internet users is also reflected in the worldwide growth of social media use. In 2010, statistics estimated that 970 million people across the globe used some form of social media. In 2018, that number has grown to nearly 2.62 billion people, and it is estimated that by 2021, over 3 billion people will be connected to some social media platform.[3] The hard numbers on social media use speak for themselves:

- As of the third quarter of 2018, Facebook had 2.27 billion monthly active users.
- As of June 2018, Instagram had 1 billion monthly active users.
  - 80% of Instagram users live outside the U.S.
  - 32% of all internet users are on Instagram.
  - More than 95 million photos and videos are shared on Instagram daily.
- As of the third quarter of 2018, Twitter had 326 million monthly active users.
- LinkedIn has 260 million monthly active users.[4]

Social media's impact is no novel concept in 2019. Indeed, social media use is a commonplace aspect of our everyday lives, and it is pervasive in both personal and commercial/marketing activities. While social media has the ability to bring together like-minded people, facilitate a free exchange of ideas, create and expand markets, and foster a sense of community among users; social media also brings with it an increased exposure to risk. With people increasingly living their lives online, private interactions have become public, enhancing the potential for violations of privacy rights. In addition, what traditionally would involve a face-to-face interaction can now be done through a computer, often under the guise of anonymity. While the physical disconnect between social media users and their audience can encourage a free exchange of ideas, it can also encourage people to cross the line with a false sense of impunity. Social media, however, creates a permanent record from which potential liability may flow.

While social media use may pose an increased risk of liability, the legal issues are not necessarily new—social media is swiftly becoming a common source of claims of defamation, harassment, invasion of privacy, false advertising, as well as employment claims and intellectual property claims.

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1. *http://www.itu.int/net/pressoffice/press_releases/2013/05.aspx#.UpORecSsgyo* (last visited Sept. 30, 2019).
2. http://hostingfacts.com/internet-facts-stats (last visited Sept. 30, 2019).
3. *Id.*
4. *Id.*

II. Potential Liability Arising From Social Media Use

Claims that arise from social media use are not unique and tend to involve familiar torts, such as defamation and harassment, invasion of privacy, false advertising, discrimination, employment-related discrimination, and intellectual property infringement. While the elements of these torts and legal theories of recovery have generally remained the same, the use of social media to perpetrate these torts has required courts to consider the nature and prevalence of social media use in evaluating its impact. Social media has increased, and continues to increase, exponentially the potential for liability associated with these traditional torts. This section explores the general elements of claims that tend to arise from social media use, how social media use may give rise to the claims, and examples of cases involving the use of social media.

a. Defamation and Harassment

Social media has the power to turn anyone with an internet connection into a published author. Access to online forums where one can publish their deepest or most innocuous thoughts grows every day. In social media, one can publish comments, criticisms, experiences, thoughts and opinions about people, businesses, politics, religion, public services and more, whether it is on a blog, news website's comment boards, Facebook, Instagram, Twitter, Yelp, Amazon—the ability to critique and/or comment on any topic online is seemingly endless. While there are many benefits flowing from the ease with which social media allows people to share their ideas and opinions with the world, it also increases risk. For one thing, social media allows users to voice their opinions in real time, without the benefit of an editor, time to reflect on what they are writing, or its effect. If people are unhappy about what they read in an online article from their favorite newspaper, they can post about it in the comment section. If they are unhappy with a meal at a local restaurant, they can write a scathing review on Yelp. If they are angry at a former employer, they can post about it on Facebook or Twitter. With social media, it has never been easier for people to broadcast their opinions on anything and everything affecting their daily lives.

Moreover, by taking what otherwise would be face-to-face interactions and making them digital, social media offers the guise of anonymity, making it easier for people to say things that they might otherwise not. One need look no further than the comment section of a favorite blog to find examples of comments that people likely would never make if their name were attached to it. While that anonymity may, in fact, be more illusion than reality—because internet users can be identified by their IP addresses—that has not inhibited people from saying things over social media that they likely would not say if their name was attached to the statement. In addition, social media leaves a permanent record that can be used in litigation. All

of these factors make social media fertile ground for claims of defamation and harassment.

1. Defamation

The Restatement of Torts provides that a statement is defamatory "if it tends so to harm the reputation of another as to lower him in the estimation of the community or to deter third persons from associating or dealing with him."[5] To state a claim for defamation, a plaintiff must allege:

(a) A false and defamatory statement concerning another.
(b) An unprivileged publication to a third party.
(c) Fault amounting at least to negligence on the part of the publisher.
(d) Either actionability of the statement irrespective of special harm or the existence of special harm caused by the publication.[6]

That people are more willing to make statements on social media that they would otherwise not make, and that social media allows such statements to be instantaneously broadcast to the world, makes it especially easy for the first two elements of a defamation claim to be satisfied.

For example, in *Too Much Media, LLC v. Hale*,[7] a software manufacturer that developed software to allow adult entertainment websites to track access to affiliated websites brought a claim against an individual for allegedly posting defamatory comments about the company on an online message board related to the adult entertainment industry.[8] The posts allegedly insinuated that the company was involved in criminal activity and had improperly benefitted financially from a security breach of its software.[9] The defendant argued that her message board postings were protected under New Jersey's Shield Law, which provides protection from liability for news reporting, because she was functioning as a journalist. The court disagreed, holding, "[w]e do not find that online message boards are similar to the types of news entities listed in the statute, and do not believe that the Legislature intended to provide an absolute privilege in defamation cases to people who post comments on message boards."[10]

In another example, *Clay Corporation v. Colter*,[11] the plaintiff, a car dealership, sued the brothers of a former employee for defamation for statements made on Facebook and Twitter. After the former employee was fired from the car dealership, her brothers allegedly created a Facebook page and Twitter account, from which they made statements claiming that the plaintiff had unlawfully discriminated

5. RESTATEMENT (SECOND) OF TORTS § 559 (1977).
6. RESTATEMENT (SECOND) OF TORTS § 558 (1977).
7. 20 A.3d 364 (N.J. 2011).
8. *Id.* at 368.
9. *Id.* at 368–70.
10. *Id*. at 368.
11. NOCV2012-01138, 2012 WL 6554752 (Mass. Super. Ct. Dec. 11, 2012).

against their sister because she had brain cancer.[12] The defendants moved to dismiss the complaint on the ground that the suit violated Massachusetts's "anti-SLAPP," or strategic lawsuit against public participation, statute, which bars suits or claims against a party based on that party's "exercise of its right to petition under the constitution of the United States or of the commonwealth."[13] The court noted, "[o]rganizing or participating in a boycott or picketing for the purpose of directly or indirectly influencing a government official or body—including such activities conducted online or through social media—would therefore constitute petitioning activity that is protected by the anti-SLAPP statute."[14] The court, however, denied the motion to dismiss, holding that the social media activity in question was not directed at a government official or body; but, rather, it was intended to produce a purely commercial result—the boycott of a private business. Therefore, the anti-SLAPP statute was inapplicable.[15]

Even law firms are not safe from the potential for liability arising out of their use of social media. For example, a recent action, *Bock & Hatch, LLC v. McGuireWoods, LLP*, involved allegedly false and defamatory statements made by McGuireWoods in an article posted on a blog run by the firm (Chiem, 2014). Bock & Hatch alleges that the article entitled, "Integrity & Adequacy of Counsel – Creative Montessori Learning Centers v. Ashford Gear LLC" misstated the district court's findings in a case in which Bock & Hatch represented the plaintiffs.[16] The article described alleged misconduct on the part of Bock & Hatch that led to the Seventh Circuit Court of Appeals to vacate class certification in that case.[17] Specifically, the article stated that Bock & Hatch promised to keep certain information confidential, when, in fact, it intended to use the information to file a number of class action lawsuits, and the District Court found that Bock & Hatch's conduct lacked integrity.[18] Bock & Hatch, in its lawsuit against McGuireWoods, alleged that the article was false and defamatory in misrepresenting Bock & Hatch's actions in the underlying lawsuit and in misrepresenting the findings of the District Court.[19]

Claims involving online defamation continue to proliferate, requiring courts to delve further into the both the tradition elements and defenses associated with such claims. In *Nunes v. Rushton,*[20] author Rachel Nunes brought suit against another author, Tiffanie Rushton, alleging claims of defamation, copyright infringement, false advertising, and harassment, which arose out of an online campaign Rushton instituted against Nunes after Nunes accused her publicly of plagiarizing Nunes'

12. *Id.* at *1.
13. *Id.* at *2.
14. *Id.* at *3.
15. *Id*. at 3–4.
16. *Id.*
17. *Id.*
18. *Id.*
19. *Id.*
20. 299 F. Supp. 3d 1216 (D. Utah March 9, 2018).

novels.[21] As to the defamation claims, Rushton posted on various online forums, both as herself and using over fifteen "sock puppet" accounts to criticize both Nunes personally, as well as her works.[22] Rushton's online comments ran the gamut from calling Nunes a "fraud," to claiming that Nunes had harassed Rushton and was trying to scam her readers into supporting her claims against Rushton, etc.[23] After considering the nature of all of the online statements made by Rushton, the court dismissed Nunes' defamation claims outright, ultimately finding that the majority of the comments were statements of "opinion" and/or would have been understood to "be no more than rhetorical hyperbole."[24]

For website operators, the federal Communications Decency Act (CDA) contains a safe harbor from defamation claims based on the comments that others post on their websites by providing, "[n]o provider or user of an interactive computer service shall be treated as the publisher or speaker of any information provided by another information content provider."[25] The safe harbor, however, is not entirely safe for website operators, as multiple courts have held that website operators may be liable for defamatory postings by users of their websites if they "encourage" users to make defamatory posts.

In *Jones v. Dirty World Entertainment Recordings, LLC*,[26] the court held, "a website owner who intentionally encourages illegal or actionable third-party postings to which he adds his own comments ratifying or adopting the posts becomes a 'creator' or 'developer' of that content and is not entitled to immunity."[27] In that case, the defendant company and its operator were sued by the plaintiff for allegedly defamatory posts made on the website about the plaintiff. Specifically, website users posted comments about the sexual habits of the plaintiff, a Cincinnati Bengals cheerleader, on the defendants' website *https://thedirty.com*. The website operator then added his own taglines to the posts, which were displayed on one page as a single story. The plaintiff repeatedly requested that the posts be removed, and the defendants refused. The plaintiff eventually filed a lawsuit, and the website operator claimed immunity under the CDA. The court found that the website operator had not been "neutral with respect to the offensiveness of the content," and that by adding taglines to the allegedly defamatory postings, he had "effectively ratified and adopted" them.[28] The District of Maryland reached a similar conclusion with respect to the limited nature of CDA immunity in deciding a motion to dismiss another defamation lawsuit filed against the same website in *Hare v. Richie*.[29] In that case, the court found that the CDA "was not meant to create a lawless no-man's-

21. *Id.* at 1222–23.
22. *Id.* at 1222.
23. *Id.* at 1230.
24. *Id.* at 1232 (quoting *Greenbelt Cooperative Publishing Association, Inc. v. Bresler,* 398 U.S. 6, 14 [1970]).
25. 47 U.S.C. § 230(c)(1)(2012).
26. 965 F. Supp. 2d 818 (E.D. Ky. 2013).
27. *Id.* at 820.
28. *Id.* at 823.
29. Civil Action No. ELLH-11-3488, 2012 U.S. Dist. LEXIS 122893 (D. Md. Aug. 29, 2012).

land on the Internet," and by allegedly posting his own comments on each defamatory posting by a third party, the website's operator was potentially taking himself out of the scope of immunity granted by the CDA.[30] Similarly, in *Huon v. Denton,*[31] the Seventh Circuit reversed the underlying District Court's dismissal of defamation claims that the plaintiff, Huon, asserted against Gawker, Inc. and Jezebel, holding that the CDA immunity did not apply where employees of the website allegedly encouraged and invited potentially defamatory comments on an online article relating to the plaintiff's acquittal of rape charges.

The nature of social media, which publishes content for the world to see, makes it a fertile ground for defamation claims. As these examples illustrate, even seemingly innocuous or protected online activity, such as blogging about a recent court decision or hosting comments made by others, can create defamation exposure.

2. Harassment

In addition to, and often overlapping with, defamation claims, social media has given rise to claims of various forms of harassment. One of the most high-profile examples of social media harassment has become known as "cyberbullying" (Hoffman, 2010). While bullying certainly is nothing new, social media has taken bullying from school playgrounds, hallways and cafeterias to cyberspace, providing a broad, public platform for harassment. Cyberbullying may encompass any number of common law or statutory claims,[32] including claims under state or federal hate crimes laws and anti-discrimination laws, as well as common law torts protecting against emotional harm, such as intentional or reckless infliction of emotional distress. The Restatement of Torts provides that:

> An actor who by extreme and outrageous conduct intentionally or recklessly causes severe emotional harm to another is subject to liability for that emotional harm and, if the emotional harm causes bodily harm, also for the bodily harm.[33]

Claims such as intentional or reckless infliction of emotional distress can be accompanied by a defamation claim in cyberbullying cases. For example, in *D.C. v. R.R.*,[34] the court rejected an argument that cyberbullying was simply "jocular humor," that was entitled to First Amendment protection. In this case, the plaintiff, a 15-year old aspiring musician and entertainer maintained a website promoting his career, which included an open comments section. Several of the plaintiff's classmates made a number of homophobic comments and threats of physical

30. *Id.* at *40–54.

31. 841 F.3d 733 (7th Cir. 2016).

32. A majority of the states have enacted laws prohibiting bullying, including cyberbullying. Links to the various state laws are available at *https://www.stopbullying.gov/laws/index.html*.

33. RESTATEMENT (THIRD) OF TORTS: PHYS. & EMOT. HARM § 46 (2012).

34. 182 Cal.App.4th 1190 (2010).

violence directed at the plaintiff in the comments section of his website,[35] causing the plaintiff to withdraw from his school and move to a different school district.[36] The plaintiff subsequently sued the students who posted the comments and their parents, alleging defamation, intentional infliction of emotional distress, and claims under California's hate crimes law.[37] The court refused to strike the lawsuit under California's anti-SLAPP statute,[38] which protects against lawsuits designed to chill free speech, holding that the defendants had not shown that the speech was protected speech; and, even if it were protected speech, it was not made in connection with a public issue, as required for protection under the statute.[39]

In contrast, in *Finkel v. Dauber*,[40] the plaintiff, a high school student, brought a defamation suit against several classmates who created a Facebook page on which they posted a series of sexually-explicit comments about the plaintiff, including, among other things, that the plaintiff had contracted AIDS and was involved in bestiality.[41] The court found that the Facebook comments were not actionable statements of fact, instead finding that the comments were nothing more than "puerile attempts by adolescents to outdo each other," such that a reasonable person would not have believed the comments to be true.[42]

Online harassment claims have also given rise to statutory harassment and discrimination claims, including under Title VI of the federal Civil Rights Act of 1964 and Title IX of the Education Amendments of 1972, against the institutions and schools that fail to respond to reports of cyberbullying by and between students. In *Estate of Olsen v. Fairfield City School District Board of Education,*[43] the family of a deceased student who committed suicide after being bullied, abused and cyberbullied by classmates, both in person and heavily through social media, sued the school district. The plaintiff sought to hold the school district liable under various theories of liability, but the plaintiff specifically alleged that the school's failure to reasonably investigate and respond to the decedent's and her family's complaints of cyberbullying violated Title VI and Title IX.[44] The family also asserted common law claims of negligence and wrongful death against the school district. In denying the school district's motion to dismiss these claims, the Southern District of Ohio allowed the plaintiffs to proceed on the statutory and common law negligence and wrongful death claims, finding that the evidence and allegations of cyberbullying were "so severe, pervasive, and objectively offensive," and the

35. *Id.* at 1200.
36. *Id.* at 1201.
37. *Id*.
38. Cal. C.P.P. § 424.16 (West 2011).
39. 182 Cal.App.4th at 1210.
40. 906 N.Y.S.2d 697 (N.Y. Sup. Ct. 2010).
41. *Id.* at 698–701.
42. *Id*. at 701–03.
43. 341 F.Supp.3d 793 (S.D. Ohio 2018).
44. *Id.* at 799.

school's alleged failure to conduct any investigation in response to reports of bullying and cyberbullying was unreasonable.[45]

Colleges and universities are similarly not immune to potential exposure resulting from online harassment by and between students. In *Feminist Majority Foundation v. Hurley*,[46] the Fourth Circuit Court of Appeals similarly denied motions to dismiss filed by the defendants, which included various administrators at the University of Mary Washington, against claims arising out of online harassment of students by other students.[47] Plaintiffs were members of an on-campus feminist organization, who claimed that they were sexually harassed online, primarily by members of the University's rugby team, via a social media platform called Yik Yak (now defunct).[48] The harassment was reported to school administrators, and plaintiffs ultimately brought suit against the University, alleging Title IX discrimination arising out of the online harassment and the school's alleged failure to respond.[49] In evaluating the Title IX claims, the Court specifically held that the student-on-student sexual harassment might be imputed to the school (an element in proving a Title IX claim), because:

> Although the harassment was communicated through cyberspace, the Complaint shows that [the University] had substantial control over the context of the harassment because it actually transpired on campus. Specifically, due to Yik Yak's location-based feature, the harassing and threatening messages originated on or within the immediate vicinity of the [University] campus. In addition, some of the offending Yaks were posted using the University's wireless network, and the harassers necessarily created those Yaks on campus. Moreover, the harassment concerned events occurring on campus and specifically targeted [University] students.[50]

In another case involving online harassment at a university, in *Harbi v. Massachusetts Institute of Technology,*[51] the plaintiff, a resident of France, was enrolled in online courses provided through a partnership between the Massachusetts Institute of Technology (MIT) and Harvard University. The plaintiff created a Facebook group for one of the online courses taught by an MIT professor, who also joined the Facebook group. The plaintiff and the MIT professor began communicating via the Facebook group and via email, and those communications eventually turned intimate and sexual in nature.[52] Toward the end of the online

45. *Id.* at 804.
46. 911 F.3d 674 (4th Cir. 2018).
47. *Id.* at 679.
48. *Id.* at 680–81.
49. *Id.*
50. *Id.* at 687.
51. Civil Action No. 16-12394, 2017 WL 3841483 (D. Mass. Sept. 1, 2017).
52. *Id.* at *1.

course, the professor intimated that the plaintiff would not successfully complete the course unless their online communications continued.[53] The plaintiff later filed a lawsuit against MIT and the professor, alleging Title IX discrimination and other state law claims arising out of the professor's online harassment.[54] Defendants filed motions to dismiss. The Court dismissed the Title IX discrimination claims on the ground that Title IX protections only extend to persons "in the United States," and the plaintiff was a "French student, studying in France," and had "no relevant history of physical presence in the United States."[55] However, the Court denied dismissal of the negligence claims against MIT and the professor, finding the complaint sufficiently alleged facts that the defendants owed a duty to the plaintiff and potentially breached that duty.[56]

While bullying is nothing new, the ubiquity of social media use, particularly among young people, means that the frequency of cyberbullying claims is likely to continue increasing. Moreover, as the *Feminist Majority Foundation* and *Harbi* cases illustrate, it is not only the bullies that face potential exposure.

b. Invasion of Privacy

The rise of social media has spawned a serious debate about the role of privacy in the modern internet age. On the one hand, issues concerning data privacy amongst social media users, particularly involving data mined by Facebook, have erupted in the past couple of years, evolving into numerous class action lawsuits against and a federal investigation of Facebook. (Fontana & Romm, 2018). While these data privacy issues are at the forefront of current events and discussions regarding legal and privacy issues in social media, these issues are beyond the scope of this particular article and presentation. The invasion of privacy issues addressed herein relating more narrowly to individual privacy tort claims, as opposed to the larger issues regarding the responsibility of social networking sites to protect user information.

That being said, Twitter, Facebook and other social networking sites have allowed people to make public virtually every detail of their lives and interactions with others. The public nature of social interactions through social media certainly increases the potential for invasion of privacy-related liability. Social media also makes it far easier to publicly broadcast private information about another person, thus increasing not only the potential for claims, but also the potential damages when a claim is brought.

The Restatement of Torts recognizes four distinct torts falling within the umbrella of invasion of privacy. These torts include intrusion upon seclusion,[57]

53. *Id.* at *2.
54. *Id.* at *3.
55. *Id.* at *4.
56. *Id.* at *8–9.
57. RESTATEMENT (SECOND) OF TORTS § 652B (1977) ("One who intentionally intrudes, physically or otherwise, upon the solitude or seclusion of another or his private affairs or concerns,

appropriation of name or likeness,[58] publicity given to private life,[59] and publicly placing a person in a false light.[60] While each tort is distinct, they generally concern an individual's right "to be let alone."[61]

One such social media-related invasion of privacy claim was made in *Yath v. Fairview Clinics, N.P.*[62] In that case, an employee of the defendant, a health clinic, who was also a relative of the plaintiff's husband, without authorization accessed the plaintiff's medical file out of curiosity after seeing the plaintiff in the clinic.[63] After learning from the medical file that the plaintiff had visited the clinic to be screened for sexually-transmitted diseases related to a new sexual partner, the employee told this information to the plaintiff's sister-in-law, who, in turn, told it to plaintiff's husband.[64] In addition, the employee and the sister-in-law allegedly created a MySpace page called "Rotten Candy" (the plaintiff's first name is Candice), which posted information about the plaintiff from the medical file, including that the plaintiff had a sexually-transmitted disease and that she had cheated on her husband.[65] The plaintiff brought a claim against the health clinic for invasion of privacy. The lower court granted the health clinic's motion for summary judgment on the ground that the temporary posting of data from the plaintiff's medical file on MySpace failed to meet the "publicity" requirements of a claim for invasion of privacy, which, under the relevant state law, required a showing, "(1) a defendant gave 'publicity' to a matter concerning [plaintiff's] private life, (2) the publicity of private information would be highly offensive to a reasonable person, and (3) the matter is not of legitimate concern to the public."[66] The lower court reasoned that the MySpace page was only accessed by a small number of people and was only available for 24 to 48 hours.[67] The appellate court affirmed, but on different grounds. The appellate court first found that even though only a few people viewed the MySpace page and it was only available online for a short period of time, the information was nonetheless made public for anyone to view, and, thus, the

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is subject to liability to the other for invasion of his privacy, if the intrusion would be highly offensive to a reasonable person.").

58. *Id.* at § 652C ("One who appropriates to his own use or benefit the name or likeness of another is subject to liability to the other for invasion of his privacy.").

59. *Id.* at § 652D ("One who gives publicity to a matter concerning the private life of another is subject to liability to the other for invasion of his privacy, if the matter publicized is of a kind that (a) would be highly offensive to a reasonable person, and (b) is not of legitimate concern to the public.").

60. *Id.* at § 652E ("One who gives publicity to a matter concerning another that places the other before the public in a false light is subject to liability to the other for invasion of his privacy, if (a) the false light in which the other was placed would be highly offensive to a reasonable person, and (b) the actor had knowledge of or acted in reckless disregard as to the falsity of the publicized matter and the false light in which the other would be placed.").

61. *Id.* at § 652A.

62. 767 N.W.2d 34 (Minn. Ct. App. 2009).

63. *Id.* at 38.

64. *Id.* at 38–39.

65. *Id.* at 39.

66. *Id.* at 42.

67. *Id.* at 43.

"publicity" requirement of invasion of privacy was satisfied.[68] However, the appellate court found that the plaintiff had not demonstrated that the defendant health clinic or its employees were involved in creating the MySpace page.[69]

In most instances, and as discussed above, social media sites themselves, like Facebook, Instagram and Twitter, are immune from invasion of privacy claims under the federal Communications Decency Act (CDA). However, such immunity does not extend to claims against individual users. In general, courts are in agreement that, notwithstanding the individual's privacy settings, any information a person posts about themselves on social media is not protected as "private." As illustrated in the *Yath* case, however, issues arise when others post information on social media about an individual without that person's authority or consent.

c. Employment Claims

Social media has become commonplace in the employment setting. For example, social media can play a crucial role in the hiring process, as companies use social networking sites to attract and screen candidates for employment.[70] In addition, as any look around the typical office will confirm, employee use of social media in the workplace is pervasive (Bass, 2012). The ubiquity of social media in the workplace raises serious issues regarding potential liability for employers. In particular, social media creates an environment for potential liability over which employers may have very little control. For example, while monitoring employee interactions at the water cooler may be relatively easy, monitoring employee interactions over social media, especially interactions that take place outside working hours or from an employee's home or mobile device, is likely to be much more expensive and difficult, if possible. Nonetheless, employee use of social media may give rise to potential employer liability.

For example, social media was the catalyst for a discrimination claim in *Blakey v. Continental Airlines, Inc*.[71] In that case, a female pilot brought suit against her employer, Continental Airlines, for sexual harassment and hostile work environment after fellow Continental pilots posted allegedly harassing gender-based messages on a message board for Continental employees available through Continental's computer system. The court held that the fact that the message board was not physically located in the workplace was immaterial; to the extent that Continental derived a benefit from the message board, and was aware of harassment

68. *Id.*

69. *Id*.

70. A survey by CareerBuilder found that two out of three companies admitted to using social networking sites to research job candidates. See *Thirty-Seven Percent of Companies Use Social Networks to Research Potential Job Candidates, According to New CareerBuilder Survey*, PR Newswire, *http://www.prnewswire.com/news-releases/thirty-seven-percent-of-companies-use-social-networks-to-research-potential-job-candidates-according-to-new-careerbuilder-survey-147885445.html* (last visited Dec. 28, 2012).

71. 751 A.2d 538(N.J. 2000).

occurring on the message board, Continental could not simply disregard the conduct.[72]

Similarly, in *Amira-Jabbar v. Travel Services, Inc.*,[73] the plaintiff brought a hostile work environment claim against her former employer after coworkers had allegedly posted racist comments about a picture that was taken of the plaintiff at a company outing in the comments section of a Facebook page. The defendant argued that it could not be liable for the comments made on Facebook, because the Facebook page belonged to an individual employee, not the employer, and the employee had no authority to act on the employer's behalf with respect to the Facebook page.[74] The plaintiff argued that the employer was liable for the comments made on the Facebook page, because it allowed its employees to post photos and comments on Facebook during company time and for company purposes.[75] The court ultimately granted the employer's motion to dismiss, holding that the Facebook incident, and several other alleged incidents, were too isolated to establish a hostile work environment, and that the employer had promptly investigated the incidents and taken remedial measures, including blocking employee access to Facebook from office computers.[76]

Social media use also formed the basis of the claims alleged in *Ehling v. Monmouth-Ocean Hosp. Serv. Corp.*[77] In that case, the plaintiff was suspended from her job as a nurse, allegedly based on posts she made on her Facebook page. The plaintiff limited access to her Facebook page to only her "friends" on the social media website. One of her "friends," however, included a co-worker, who, after reading a post the plaintiff made regarding a shooting at the United States Holocaust Memorial Museum, sent screen captures of the post to their employer. The post insinuated that the shooter, who himself was shot by security guards, should have been left to die by Washington, DC paramedics. After reading the post, the plaintiff's employer suspended her with pay, on the ground that the comment reflected a "deliberate disregard for patient safety." The plaintiff brought suit against her employer alleging, among other things, a violation of the federal Stored Communications Act (SCA), which is intended to protect electronic communications that are configured to be private.[78] The court first found that non-public Facebook posts are covered by the SCA. However, the court held that the

72. *Id*. at 552 ("[E]mployers do have a duty to take effective measures to stop co-employee harassment when the employer knows or has reason to know that such harassment is part of a pattern of harassment that is taking place in the workplace and in settings that are related to the workplace.").

73. 726 F. Supp.2d 77 (D.P.R. 2010).

74. *Id.* at 83.

75. *Id.*

76. *Id.* at 86–87.

77. 961 F. Supp. 2d 659 (D. N.J. 2013).

78. Specifically, the SCA provides that whoever, "(1) intentionally accesses without authorization a facility through which an electronic communication service is provided; or (2) intentionally exceeds an authorization to access that facility; and thereby obtains, alters or prevents the authorized access to a wire or electronic communication while in electronic storage in such a system" shall be liable for damages. 18 U.S.C. § 2701(a); 18 U.S.C. § 2707.

SCA's "Authorized User Exception," which provides that the SCA, "does not apply with respect to conduct authorized . . . by a user of that service with respect to a communication of or intended for that user,"[79] applied in this case, because the plaintiff's Facebook post was accessed by a co-worker who was granted permission to view the post by virtue of being the plaintiff's Facebook "friend." The court noted that the co-worker who sent a screen capture of the post to the plaintiff's employer had done so voluntarily, and the employer had not solicited or encouraged the co-worker to send the post.[80]

In *Jackson v. Walgreen Co.,*[81] the plaintiff was discharged from his employment at Walgreens after the plaintiff had posted a pornographic video on a male coworker's Facebook page, and in a comment on the post referenced two female employees in connection with the video (although the female employees did not actually appear in the video itself).[82] Walgreens terminated the plaintiff for violating the company's Social Media Policy, and the plaintiff brought suit against Walgreens after he was denied unemployment benefits.[83] The Missouri appellate court found that violation of an employer's Social Media Policy constitutes employee misconduct, in violation of the employer's rules, warranting disqualification of unemployment benefits.[84]

Social media presents another medium by which co-workers interact, which opens up employers to potential liability for those online interactions. Moreover, as people regularly post their personal views online—views that they may not otherwise express while at work—these online interactions are fraught with potential risks.

d. False Advertising Claims

In 2018, it was estimated that social and digital media generated 44%, or approximately $237 billion, of all advertising dollars spent worldwide, and that number is expected to grow to 51%, or approximately $240 million, in 2019 (Liedke, 2019). The exponential growth in social media advertising can be attributed to a number of factors: 1) social media users tend to fall within key advertising demographics; 2) social networking sites allow advertisers to target groups of people who share similar characteristics and preferences; and 3) social media allows companies to directly interact with customers in real-time, offering a more personal, interactive experience than traditional print or broadcast advertising. Certain aspects of social media, however, increase the potential for liability. The interactive nature of social media can sometimes blur the line between the company and the consumer, with the company encouraging the consumer to generate and share content about

79. 18 U.S.C. § 2701(c) (2012).
80. 961 F. Supp. 2d at 669–71.
81. 516 S.W.3d 391 (Mo. Ct. App. 2017).
82. *Id.* at 392.
83. *Id.*
84. *Id.* at 394.

the company or its products, in hopes of creating buzz or having the content "go viral." By ceding some control over advertising content to consumers, companies may be exposing themselves to increased risk for the resulting consumer-generated content.

As with traditional print and broadcast advertising, social media advertising is subject to regulations and restrictions against false or deceptive advertising, including under various state laws, and federal regulations.[85] In particular, private claims of false or deceptive advertising typically are brought under the federal Lanham Act, which provides that:

85. For example, in 2009, the Federal Trade Commission issued revised guidelines regarding the use of endorsements and testimonials in advertising, providing, "[w]hen there exists a connection between the endorser and the seller of the advertised product that might materially affect the weight or credibility of the endorsement (*i.e.*, the connection is not reasonably expected by the audience), such connection must be fully disclosed." 16 C.F.R. § 255.5 (2009). The regulations cite two examples that specifically address the use of endorsements through social media:

> Example 7: A college student who has earned a reputation as a video game expert maintains a personal weblog or "blog" where he posts entries about his gaming experiences. Readers of his blog frequently seek his opinions about video game hardware and software. As it has done in the past, the manufacturer of a newly released video game system sends the student a free copy of the system and asks him to write about it on his blog. He tests the new gaming system and writes a favorable review. Because his review is disseminated via a form of consumer-generated media in which his relationship to the advertiser is not inherently obvious, readers are unlikely to know that he has received the video game system free of charge in exchange for his review of the product, and given the value of the video game system, this fact likely would materially affect the credibility they attach to his endorsement. Accordingly, the blogger should clearly and conspicuously disclose that he received the gaming system free of charge. The manufacturer should advise him at the time it provides the gaming system that this connection should be disclosed, and it should have procedures in place to try to monitor his postings for compliance.
>
> Example 8: An online message board designated for discussions of new music download technology is frequented by MP3 player enthusiasts. They exchange information about new products, utilities, and the functionality of numerous playback devices. Unbeknownst to the message board community, an employee of a leading playback device manufacturer has been posting messages on the discussion board promoting the manufacturer's product. Knowledge of this poster's employment likely would affect the weight or credibility of her endorsement. Therefore, the poster should clearly and conspicuously disclose her relationship to the manufacturer to members and readers of the message board.

Id.

> Any person who, on or in connection with any goods or services …, uses in commerce any word, term, name, symbol, device, any combination thereof, any false designation of origin, false or misleading description of fact, or false or misleading representation or fact, which—
>
> …
>
> (B) in commercial advertising or promotion, misrepresents the nature, characteristics, qualities or geographic origin of his or her or another person's goods, services or commercial activities, shall be liable in a civil action by any such person who believes that he or she is likely to be damaged by such act.[86]

There are a number of examples of claims under the federal Lanham Act arising out of allegedly false or deceptive advertising on social media. For example, in *Doctor's Associates., Inc. v. QIP Holders, LLC*, [87] sandwich chain Subway brought suit against its competitor Quiznos for false advertising under the federal Lanham Act in connection with Quiznos' web-based contest that asked consumers to submit videos demonstrating why their product was superior to Subway's, which were subsequently posted on Quiznos' website. Subway alleged that the advertisements falsely portrayed Subway's sandwiches and that Quiznos was responsible for their content, even though the videos were made by consumers. The court rejected Quiznos' argument that it could not be liable under the federal Lanham Act because the videos were made by consumers, holding that Quiznos' ads constituted "commercial advertising and promotion" under the federal Lanham Act; therefore, they were actionable. The court also held that there were issues of fact regarding whether Quiznos merely published the consumer videos or instead was actively responsible for the creation and development of the allegedly disparaging statements, such that it would not be entitled to immunity under the CDA.

In *Doe v. Friendfinder Network, Inc.*,[88] the plaintiff sued the defendant, who operated a number of affiliated social networking sites, including AdultFriendFinder, which advertised itself as, "the World's largest SEX and SWINGER Personal Community," for, among other things, false advertising under the federal Lanham Act.[89] The plaintiff alleged that someone, without her knowledge, had created a profile on the defendant's social media site under the name "petra03755" that included various biographical and personal information, including her sexual proclivities, such that the profile identified the plaintiff as

86. 15 U.S.C. § 1125(a)(1) (2012).
87. Civil Action No. 3:06–cv–1710, 2010 WL 669870 (D. Conn. Feb. 19, 2010).
88. 540 F.Supp.2d 288 (D. N.H 2008).
89. *Id.* at 292.

"petra03755" to her community.[90] The plaintiff alleged that the defendant used portions of the "petra03755" profile as "teasers" on internet search engines and advertisements on third-party websites, thus falsely communicating to consumers that the plaintiff was a member of the site and deceiving consumers into registering for the site in order to meet the plaintiff. The court denied the defendant's motion to dismiss the federal Lanham Act claims, holding that the plaintiff has adequately alleged false advertising under the federal Lanham Act, by alleging that the defendant made unauthorized use of the plaintiff's identity, creating the false and allegedly harmful impression that the plaintiff was affiliated with the defendant.[91]

Another case, *Bluestar Management, LLC v. The Annex Club, LLC*,[92] involved a plaintiff and defendant, which each owned and operated rooftop clubs located across the street from Wrigley Field in Chicago, from which customers can watch the baseball games.[93] The plaintiff alleged, among other things, that the defendant made false advertisements in violation of the federal Lanham Act by attempting to pass off the plaintiff's rooftop club as its own by paying for a website to host a "sponsored result" advertisement that used a picture of the plaintiff's rooftop club alongside a link to the defendant's website. The plaintiff also alleged that the defendant had falsely represented on the defendant's Facebook page that Cubs fans could "[e]njoy a fantastic unobstructed view of Wrigley Field and the Chicago Cubs from any one of our three new state of the art facilities," despite the fact that one of the defendant's rooftop clubs was closed for business. The court held that the plaintiff had adequately pleaded a claim for false advertising under the federal Lanham Act.

In *L.A. Taxi Coop., Inc. v. Uber Technologies, Inc.,* the plaintiff alleged that Uber, the transportation network that operates exclusively through a smart phone app, engaged in false advertising based upon statements and representations on Uber's website and other online platforms concerning Uber's more "rigorous" safety and driver screening standards.[94] The court dismissed the plaintiff's federal Lanham Act claims relating to statements that Uber representatives made to certain media outlets in online articles and journals about the company, because such did not constitute "commercial speech" under the federal Lanham Act. However, the Court refused to dismiss false advertising claims against Uber arising out of various statements in its online advertisements regarding its safety standards.

Vitamins Online, Inc. v. HeartWise, Inc.,[95] also involved federal Lanham Act claims. In this case, the plaintiff alleged that HeartWise improperly had employees vote on and review the plaintiff's products on Amazon.com, Inc. (Amazon), which increased the likelihood that potential customers would see positive reviews of its products first and negative reviews last. The plaintiff claimed that such practices

90. *Id.*
91. *Id.*
92. No. 09 C 4540, 2010 WL 2802213 (N.D. Ill. July 12, 2010).
93. *Id.* at *1.
94. 114 F.Supp.3d 852 (N.D. Cal. 2015).
95. 207 F. Supp. 3d 1233 (D. Utah 2016) (vacated for additional expert discovery to be conducted, May 11, 2017).

were unfair competition and false advertising under the federal Lanham Act because it unfairly manipulated Amazon customer review system. The court denied the defendant's motion for summary judgment, finding that there were issues of fact as to whether the defendant's conduct constituted false advertising under the federal Lanham Act.

Social media lowers barriers to entry and creates opportunities for "viral" advertising, making it easier and cheaper for companies to advertise their products and services to a large audience. As the cases discussed above demonstrate, however, social media advertising also creates an increased exposure to claims of false advertising.

e. Intellectual Property Claims

Social media may also give rise to claims of infringement of intellectual property rights. By allowing users to instantly share content, such as videos, photographs and other files, social media makes it easy for users to improperly use copyrighted material. The sheer number of social media users sharing content online means that the risk of copyright infringement claims is significant.

Copyright is governed by the federal Copyright Act of 1976, which protects "original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device."[96] Section 106 of the federal Copyright Act provides that:

> [T]he owner of copyright under this title has the exclusive rights to do and to authorize any of the following:
>
> (1) to reproduce the copyrighted work in copies or phonorecords;
> (2) to prepare derivative works based upon the copyrighted work;
> (3) to distribute copies or phonorecords of the copyrighted work to the public by sale or other transfer of ownership, or by rental, lease, or lending;

96. 17 U.S.C. § 102(a) (2012). The Copyright Act further provides, "works of authorship" include the following categories:

> (1) literary works.
> (2) musical works, including any accompanying words.
> (3) dramatic works, including any accompanying music.
> (4) pantomimes and choreographic works.
> (5) pictorial, graphic and sculptural works.
> (6) motion pictures and other audiovisual works.
> (7) sound recordings.
> (8) architectural works.
>
> *Id.*

> (4) in the case of literary, musical, dramatic, and choreographic works, pantomimes, and motion pictures and other audiovisual works, to perform the copyrighted work publicly;
> (5) in the case of literary, musical, dramatic, and choreographic works, pantomimes, and motion pictures and other audiovisual works, to display the copyrighted work publicly; and
> (6) in the case of sound recordings, to perform the copyrighted work publicly by means of a digital audio transmission.[97]

Section 501 of the federal Copyright Act provides the owner of a copyright with a private right of action against anyone who infringes the copyright owner's exclusive rights in the copyrighted work.[98]

One highly publicized example of copyright infringement arising from social media use is *HarperCollins Publishers, LLC v. Gawker Media LLC*.[99] In that case, the publisher of former vice presidential candidate Sarah Palin's book, "America By Heart," brought a copyright infringement suit against a blogger who posted 21 pages of Sarah Palin's book on the popular website Gawker Media several days prior to the release date of the book.[100] The blogger argued that the blog post constituted "fair use"[101] and, therefore, was not a violation of the publisher's copyright.[102] Granting the publisher's motion for a preliminary injunction, the court held that the publisher was likely to succeed on the merits of the claim, because the blog posting

97. 17 U.S.C. § 106 (2012).
98. 17 U.S.C. § 501 (2012).
99. 721 F. Supp. 2d 303 (S.D.N.Y. 2010).
100. *Id.* at 304–05.
101. The "fair use" defense is codified in the Copyright Act, which provides that:

> [T]he fair use of a copyrighted work ... for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research, is not an infringement of copyright. In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include—
>
> (1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes.
>
> (2) the nature of the copyrighted work.
>
> (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
>
> (4) the effect of the use upon the potential market for or value of the copyrighted work.

17 U.S.C. § 107 (2012).
102. 721 F. Supp. 2d at 306.

did not constitute "fair use," where the post contained minimal commentary and simply copied, verbatim entire pages of the book.[103]

In addition to copyright infringement, trademark infringement claims can arise from social media use. As discussed above, social media advertising has become critical for many businesses. With the increased use of social media for advertising, however, comes increased potential for claims of trademark infringement arising from that advertising. Federal trademark claims are governed by the federal Lanham Act, which provides that:

> Any person who, on or in connection with any goods or services, or any container for goods, uses in commerce any word, term, name, symbol, or device, or any combination thereof, or any false designation of origin, false or misleading description of fact, or false or misleading representation of fact, which—
>
> (A) is likely to cause confusion, or to cause mistake, or to deceive as to the affiliation, connection, or association of such person with another person, or as to the origin, sponsorship, or approval of his or her goods, services, or commercial activities by another person, …
>
> shall be liable in a civil action by any person who believes that he or she is or is likely to be damaged by such act.[104]

Courts have addressed trademark claims arising from social media use. For example, in *Fortune Hi-Tech Marketing, Inc. v. Isaacs*,[105] an employer, which operated a direct sales company that markets products and services to customers through the use of independent representatives, sued a former independent representative for various claims, including misappropriation of mark and trademark infringement under the federal Lanham Act.[106] Prior to being terminated, the independent representative created a social networking website for independent representatives, as well as other websites that provide online training to independent representatives who were members of the social networking website.[107] According to the employer, the independent representative misappropriated the company's trademarks and services marks and sought to profit from the company's name and goodwill through operation of the websites, which used the employer's name and logos.[108] The claim was ultimately submitted to arbitration, and the former employee agreed to take down the websites.

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103. *Id.*
104. 15 U.S.C. § 1125(a)(1) (2012).
105. Civil Action No. 10-123-KSF, 2010 WL 5391533 (E.D. Ky. Dec. 21, 2010).
106. *Id.* at *1.
107. *Id.*
108. *Id.*

In *Eppley v. Iacovelli*,[109] a surgeon who had registered his name as a trademark filed suit against a former patient who had accused the doctor of botching her facelift procedure for false designation under the federal Lanham Act for allegedly using the doctor's name and likeness on social networking and other websites to create the impression that the sites were created or authorized by the doctor. The court found that the surgeon's allegations amounted to "passing off" in violation of the federal Lanham Act.

In *Asanov v. Legeido*,[110] an employer sued a former employee for trademark infringement under the federal Lanham Act after the former employee allegedly falsely represented on LinkedIn that he was the owner of a new company that was formed by the employer. The former employee argued that he never represented that he was the owner of the company, but, rather, that the LinkedIn posting was the result of an "apparent error in the LinkedIn profiles database search index."[111] The court ultimately dismissed the claims of the plaintiff, who was acting *pro se*, because the plaintiff failed to comply with a prior order requiring the plaintiff to retain counsel and file an amended complaint.

In *Multi Time Machine, Inc. v. Amazon.com, Inc.,*[112] Multi Time Machine, Inc. (MTM), a manufacturer of watches, sued Amazon for trademark infringement under the federal Lanham Act, claiming that, even though MTM did not sell its watches on Amazon consumers could still search for MTM's products on Amazon, and the search function would display MTM's trademark as a search query, but provide customers with alternative or suggested searches and products (competitors' products) to purchase on Amazon.[113] The court granted Amazon's motion for summary judgment, which was affirmed on appeal, finding that the results of a search for MTM products were clearly labeled with the competitors' names, marks and product information, and did not use MTM's mark or name, thus eliminating any possible consumer confusion.

As social media use increases, it is likely that intellectual property claims will likewise increase, as social media gives users a platform to publish commentary and content regarding protected intellectual property of others to a wide audience.

III. Conclusion

The rapid proliferation of social media use should not come as a surprise. It allows people to express their views publicly in ways that previously were not possible. The ability to publish content easily and at little to no cost unquestionably benefits millions of individuals and companies. However, the aspects of social media that make it so popular and beneficial—the ability to publish content to a

109. No. 1:09-cv-386-SEB-DML, 2010 WL 3282574 (S.D. Ind. Aug. 17, 2010).
110. No. 3:07-1288, 2008 WL 4814261 (M.D. Tenn. Oct. 31, 2008).
111. *Id.* at *4.
112. 804 F.3d 930 (9th Cir. 2015).
113. *Id.* at 933.

wide audience quickly and cheaply—also increase the potential exposure that individuals and companies face for the types of claims discussed above.

The increase exposure created by social media raises important issues about whether such exposure is covered under traditional CGL and homeowners policies. These issues are discussed in Part II of this series, which will be published in the next issue of the *Journal of Insurance Regulation* (JIR).

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Prescription Drug Insurance Plans: Potential Cost Reductions and the Pass-Through of Manufacturer Pharmaceutical Rebates to Premiums

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Abstract

In response to the recent moves to reduce prescription drug expenses and eliminate manufacturer pharmaceutical rebates for Medicare and Medicaid, this research investigates the pass-through of manufacturer pharmaceutical rebates to premiums and examines the potential prescription drug cost reductions through efficiency improvement. The results indicate that eliminating all pharmaceutical rebates but using 50% of the eliminated rebates to lower prescription drug list prices, the premium per member month would increase by $8.6 for the whole comprehensive line, and $19.1 for Medicare Advantage. Using the median efficiency as the efficiency goal, the total cost reductions on hospital/medical expenses, prescription drug expenses, and other expenses are always more than enough to offset any potential premium increases due to the elimination of pharmaceutical rebates, no matter how much of the eliminated rebates are used to lower prescription drug list prices.

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Introduction

High prescription drug costs are a persistent issue with consumers and policymakers (Bishop, 2018). Inflation-adjusted retail prescription drug spending per capita in the U.S. increased from $90 in 1960 to $1,025 in 2017 (Kamal, Cox and McDermott, 2019). Total reimbursement for all brand-name drugs in Medicare Part D increased by 77% from 2011 to 2015 (62% after manufacturer rebates) (HHS, 2018a). One of the top priorities of the Trump Administration is to reduce the price of prescription drugs (HHS, 2018b). In May 2018, the U.S. Department of Health and Human Services (HHS) released the "American Patients First" blueprint, a comprehensive plan to lower drug prices and reduce out-of-pocket (OOP) costs (HHS, 2018b). Furthermore, in January 2019, the HHS issued a proposed rule to eliminate manufacturer rebates to plan sponsors under Medicare Part D, Medicaid managed care organizations (MCOs), or the pharmacy benefit managers (PBMs) under contract with them, in exchange for potential point-of-sale price reductions on prescription drugs (HHS, 2019). Even though the proposed rule was withdrawn in July 2019, it raised the question of how pharmaceutical rebates affect all the stakeholders, and it also drew more attention to necessitated regulatory reforms to reduce prescription drug expenses. Correspondingly, this research is designed to investigate the pass-through of manufacturer pharmaceutical rebates to premiums and examine the potential cost reductions on prescription drug expenses through promoting efficient practices of health insurers. This research aims to inform the public and provide insights to all the stakeholders on the treatment of manufacturer pharmaceutical rebates and prescription drug cost savings.

Prescription drugs are composed of generic, brand and specialty drugs. Generic drugs are of the lowest cost, while brand and specialty drugs are more expensive. The coverage preference and differential cost sharing are specified in the health insurer's formulary, which lists the covered prescription drugs in multiple tiers. Generally, Tier 1 is limited to generic drugs, Tier 2 preferred brand drugs and more expensive generics, Tier 3 non-preferred drugs, and Tier 4 specialty drugs (Torrey, 2018). There are two types of formularies: the closed formulary (only prescription drugs on the list are covered) and the open formulary (prescription drugs not on the formulary list may also be covered). Health plans are increasingly using the limited and closed formulary to rein in prescription drug costs (Managed Healthcare Executive, 2015). Additionally, health insurers frequently employ utilization management in their prescription drug benefits, particularly for high-cost medications. Common utilization management techniques for prescription drugs include prior authorization, step therapy, quantity limits, and mandatory generic substitution (American Cancer Society, 2014). Wen et al. (2017) find that prescription drug monitoring mandates are associated with a reduction in opioid prescriptions. Best practices in formulary controls and utilization management (among others) enhance the efficiency of health insurers in minimizing medical costs to provide a given level of medical services.

In the literature, data envelopment analysis (DEA) has been utilized to identify efficient and inefficient health plans; and for inefficient plans, the DEA generates efficient target levels of "inputs" and "outputs" required to bring the plan into efficient operation (Brockett, Golden and Yang, 2018; Yang and Wen, 2017). Brockett, Golden and Yang (2018) apply DEA to assess the potential savings of Medicare obtainable through optimally efficient implementation of Medicare accountable care organizations (ACOs) and Medicare Advantage plans. Similarly, Yang and Wen (2017) uses DEA to examine the potential cost reductions for the consumer operated and oriented plans (CO-OPs). Both of these two studies analyze hospital and medical expenses, claim adjustment expenses, and administrative expenses. This current research contributes to the literature by adopting the DEA approach to explore efficient prescription drug expenses and potential cost reductions of prescription drug insurance plans.

The prescription drug distribution chain consists of six stakeholders: pharmaceutical manufacturers, PBMs, health insurers (including self-insured employers), wholesalers, pharmacies, and patients (Dieguez, Alston and Tomicki, 2018). PBMs are hired by health plans to help manage their prescription drug benefits, such as setting up retail pharmacy networks and negotiating rebates with manufacturers (Roehrig, 2018). The PBM business is highly concentrated with the three largest PBMs—i.e., Express Scripts, CVS Health and OptumRx—accounting for about two-thirds of the whole market (Roehrig, 2018). To secure a preferred placement on the formulary of a health plan, the pharmaceutical manufacturer generally pays prescription drug rebates to the health insurer directly, or oftentimes through the PBM, which might retain a portion for its own compensation. Manufacturer rebates are typically a percentage of a drug's list price. Shepherd (2019) argues that PBMs' profit incentive often conflicts with efforts to minimize drug costs for drug plans and beneficiaries. The government is concerned that the rebate-based system might encourage higher list prices of prescription drugs (for more rebates) and harm patients by imposing higher OOP costs, some of which are more closely related to the list price but not the net price (the list price in the absence of the rebate amount) (HHS, 2019). Therefore, the HHS proposed to eliminate manufacturer rebates, hoping that the removed rebates would be applied to point-of-sale price concessions, and beneficiary cost-sharing would be reduced (HHS, 2019). The increased affordability might lead to more uses of prescription drugs and a reduction in other medical costs (Roebuck et al., 2015).

Nonetheless, some research indicates that manufacturer rebates actually benefit both payers and consumers by lowering premiums, government payments, and consumer OOP costs (Roehrig, 2018). Antos and Capretta (2019) argue that a redesign of Medicare Part D benefits might produce lower drug prices than the pharmaceutical rebate ban. Additionally, Visante (2017) and Visante (2018) show that there is no correlation between increasing drug prices and manufacturer rebates, and drug manufacturers set prices independent of rebates. More often, manufacturer rebates are applied to reduce premiums for all enrollees (HHS, 2019). The federal Centers for Medicare & Medicaid Services (CMS) (2018) states, "[u]nder the proposed rule, there would be a shift from rebates used to lower overall premiums

to chargebacks and lower prices that would reduce beneficiary OOP spending." Klaisner, Holcomb and Filipek (2019) document a unanimous premium increase under several scenarios after removing manufacturer rebates. Fitzpatrick and Carlson (2018) find that the average Medicare Part D premium would have been 45% and 52% higher in 2017 and 2018 without rebates. Furthermore, the CMS (2018) shows that the extra government costs ($196 billion for 2020–2029) for Medicare Part D due to premium increases are far more than offsetting the savings of beneficiaries ($25 billion for 2020–2029) under the proposed rule. In response, this current research aims to provide further evidence on the impact of manufacturer rebates by examining their pass-through to premiums of health insurers and delineating the premium impact of rebates using an alternative approach. In the literature, Duggan, Starc and Vabson (2016); Cabral, Geruso and Mahoney (2018); and Carey (2018) inspect the pass-through of government payments to Medicare Advantage plans. However, none of the previous studies have evaluated the pass-through of pharmaceutical manufacturer rebates to premiums.

Specifically, this current research analyzes the efficiency performance and the pharmaceutical rebate pass-through behavior of the four business lines of a sample of private health insurers offering prescription drug benefits: the comprehensive individual line, the comprehensive group line, the whole comprehensive (individual/group) line, and Medicare Advantage. For each of the four business lines, the DEA model is applied to generate the efficient prescription drug spending of every health insurer. The potential prescription drug cost savings are then determined by comparing the efficient prescription drug spending with the actual prescription drug spending. Additionally, the potential cost reductions on other medical costs are also calculated and presented: hospital/medical expenses (excluding prescription drug expenses), quality improvement expenses, claims adjustment expenses, and general administrative expenses. The pass-through of manufacturer rebates to premiums is quantified using the regression models for each of the four samples of insurers.

The results of this research indicate that eliminating pharmaceutical rebates would induce differential premium increases for different business lines of health insurance. However, the total cost reductions on hospital/medical expenses, prescription drug expenses, and other expenses through efficiency improvement are always more than enough to offset any potential premium increases. The findings of this research imply that policymakers and state insurance regulators may remove pharmaceutical rebates to reduce drug list prices and consumers' OOP costs, but simultaneously they should initiate innovative policy and regulatory changes to improve the efficiency of health insurers, reduce their expenses, and offset the potential premium increases. Alternatively, the policymakers and state insurance regulators may still keep pharmaceutical rebates in place but utilize the cost savings from efficiency improvement to reduce the consumers' OOP costs.

Regarding efficient practices, Chambers, Rane and Neumann (2016) review some empirical evaluations on closed formularies and find that most drug exclusion policies result in cost savings. Marsa (2019) presents various solutions to lower prescription drug prices, such as legalizing the importation of less expensive

prescription drugs from other countries. The HHS and the U.S. Food and Drug Administration (FDA) have developed a federal "Safe Importation Action Plan" proposing two pathways to allow for the importation of drugs from foreign countries (HHS and FDA, 2019). In this research, the DEA analysis identifies the efficient health insurers and generates the relative efficiency and efficient targets for inefficient health insurers. However, the efficient "best practices" and the corresponding regulatory efficiency improvement initiatives can only be uncovered through the follow-up "field inspections" of the efficient insurers. Delineation of specific "best practices" and their viability is beyond the scope of this research, and it should be a rich area for future research.

The remainder of the article is organized as follows. The next section presents the sample, data, DEA, and regression models. The third section offers descriptive statistics and univariate analyses. The fourth section analyzes the pass-through of manufacturer pharmaceutical rebates to premiums. The fifth section investigates the efficiency-based potential cost reductions. The final section concludes the article with a summary of the findings.

Data and Research Design

This research examines the potential cost reductions on prescription drug expenses and the pass-through of prescription drug rebates (manufacturer pharmaceutical rebates) to the premium of health insurers. The sample of this research comprises the health insurers from 2015 to 2017 that offer the prescription drug coverage. The data used in this research come from the health insurers' financial statements filed with NAIC.[1] There are six major business lines of private health insurance: comprehensive individual, comprehensive group, Medicare supplement, federal employees health benefits plan, Medicare Advantage, and Medicaid managed care. Pharmaceutical rebates have been reported by the business line of the health insurer since 2011, but Medicare Advantage was not separated until 2015. Consequently, this research uses the data of three years, starting in 2015 when pharmaceutical rebates for Medicare Advantage were reported separately, and ending in 2017 (the most recent year with data available).

The pharmaceutical rebates are reported aggregately for Medicaid managed care (Title XIX) and the Children's Health Insurance Program (CHIP) (Title XXI). As discussed later in this section, the two medical services utilization measures (ambulatory encounters and hospital patient days) are among the independent variables of the regression analysis and the input variables of the DEA models. However, they are not available for the CHIP plans separately. In addition, for Medicaid, the federal statutory Medicaid rebate under the Medicaid Drug Rebate

1. Pharmaceutical rebates come from the Supplemental Health Care Exhibit. Enrollment and the medical services utilization data come from the Exhibit of Premiums, Enrollment and Utilization.

Program and the state-negotiated supplemental rebates are collected by the states (MACPAC, 2018). Medicaid MCOs can negotiate their own rebates with manufacturers, but generally the rebates are very small. Consequently, Medicaid managed care is not included in this research. Furthermore, there are very few insurers with prescription drug and pharmaceutical rebate data for Medicare supplement, so it is also excluded from this research. In the reporting of pharmaceutical rebates, federal employees health plans are included in the comprehensive group line, thus they are not analyzed separately. Therefore, this research covers the business lines of comprehensive individual, comprehensive group[2] (including federal employees health benefits plans), and Medicare Advantage. Additionally, this research also analyzes the total comprehensive line (comprehensive individual/group), which aggregates the comprehensive individual and group lines.

The sample of the health insurers for each of the business lines is presented in Table 1.[3] There are 629 insurers in the comprehensive individual line, 792 insurers in the comprehensive group line, 933 insurers in the whole comprehensive (individual/group) line, and 527 insurers in Medicare Advantage. The two medical services utilization measurers are only applicable to Medicare Advantage plans but not Medicare Part D stand-alone prescription drug plans. Therefore, the insurers with Medicare Part D plans (12%) are excluded from the sample. That is, this research only analyzes the 527 insurers with Medicare Advantage plans but not Part D plans.

To investigate the impact of pharmaceutical rebates on the premium of health insurers, this research estimates the following regression model for each of the four business lines (comprehensive individual, comprehensive group, comprehensive individual/group, and Medicare Advantage)[4]:

$$Premium_{ist} = \alpha + \beta PharmaceuticalRebates_{ist} + \gamma X_{ist} + \eta Year_t + \delta State_s + \varepsilon$$

where $Premium_{ist}$ represents the earned premium per member year for each line of insurer *i* domiciled in state *s* at year *t*. The coefficient of interest would be β, which measures the impact of pharmaceutical rebates (*PharmaceuticalRebates*). *Year* is a

2. The group markets are classified into small group markets and large group markets. However, the medical services utilization measures are not available for the small group and large group markets separately. Therefore, the regression and DEA analysis of the small group and large group markets cannot be conducted separately.

3. The sample of this research comprises the health insurers included in the NAIC HealthPro dataset. Life insurers offering health insurance are not included in this research. In addition, some health insurers do not report to the NAIC. Therefore, the sample does not include all the health insurance business. However, it is reasonable to state that the sample is representative of the health insurance business lines considered in this research.

4. The 2SLS model is not adopted in this research due to the weak instrument issue. Crown, Henk and Vanness (2011) document a greater potential for inferential errors when using instrumental variables rather than the ordinary least squares regression models in all the scenarios, but the most ideal circumstances.

vector of year fixed effects, and *State* is a vector of state fixed effects. X_{ist} is a vector of control variables of insurer characteristics.

Table 1:
Number of insurers in the sample of the business line: comprehensive individual, comprehensive group, comprehensive individual/group, and Medicare Advantage

Insurer category		Sample of insurers with comprehensive individual	Sample of insurers with comprehensive group	Sample of insurers with comprehensive individual/group	Sample of insurers with Medicare Advantage
Group affiliation	Single insurers	68	97	113	36
	Small group insurers	406	429	537	224
	Big group insurers	155	266	283	267
Number of states the insurer serves	Single state insurers	479	587	702	390
	Multi-state insurers	150	205	231	137
Organization type[4]	Stock insurers	403	529	634	432
	Non-stock insurers	226	263	299	95
Total		629	792	933	527

To address the potential endogeneity concern of pharmaceutical rebates, state-fixed effects are incorporated to account for the factors that vary across the states, and year-fixed effects are included to capture the factors that vary over time (Karaca-Mandic, Abraham and Simon, 2015). This current research controls for a rich set of insurer characteristics including the insurer organization type, group affiliation, the number of states the insurer serves, the size of the insurer, business lines, and product types. Additionally, the utilization measures of medical services are incorporated to control for the effect of insureds' risk profiles. Different from Karaca-Mandic, Abraham and Simon (2015), the control variables also include the insurer's various payment methods, such as capitation payments and fee-for-service payments. For robustness checks and sensitivity tests, the regression analysis is also conducted on the sub-samples of insurers that remained in the market all three years of the sample time period; and another regression is conducted, including an additional explanatory variable—percentage of incurred claims paid in prescription drugs.

The description of the independent variables is presented in the Appendix (Yang, 2018). By group affiliation, the insurers are classified into three types: single insurers (unaffiliated with a group), big group insurers (affiliated with any of the top five groups: UnitedHealthcare, Anthem, Aetna, Humana and Cigna), small group insurers (other group insurers). The two group affiliation dummy variables (single insurers and big group insurers) are included in the regression models. The dummy

variable "single-state insurers" indicates whether the insurer serves only one state or more than one state. Most insurers do not use all the payment methods or operate in all the business lines, and they do not offer all the different types of plans. There is also some multicollinearity among the variables of payment methods, product types and business lines. Therefore, only some of them are included in the regression models (Yang, 2018).

The dependent variable "the earned premium[5] per member year" is the premium for the coverage of both hospital/medical expenses and prescription drug expenses of each line of the insurer, not just the premium of the prescription drug coverage. Therefore, this research examines the impact of pharmaceutical rebates on the total premium of each business line of the insurer. The independent variable of interest, "pharmaceutical rebates," is measured as the percentage of the gross prescription drug expenses before rebates. The prescription drug expenses after pharmaceutical rebates are referred to as "net prescription drug expenses" in this research. The definition of some expense variables are presented in Table 2. The pharmaceutical rebates considered in this research are those received by the private health insurer. The dollar amounts of this research are all adjusted to the 2017 Texas dollar (so they are comparable) by state average weekly wages, which are available from the U.S. Bureau of Labor Statistics at *https://www.bls.gov/* (Yang, 2014).

Table 2:
Definition of some expense variables

Variable	Definition
Net prescription drug expenses	Prescription drug expenses after pharmaceutical rebates
Gross prescription drug expenses	Prescription drug expenses before pharmaceutical rebates
Total net medical expenses	Hospital/medical expenses (including net prescription drug expenses)
Total gross medical expenses	Hospital/medical expenses (including gross prescription drug expenses)
Other expenses	Quality improvement, claims adjustment and general administrative expenses
Total net expenses	Hospital/medical expenses (including net prescription drug expenses) and other expenses
Total gross expenses	Hospital/medical expenses (including gross prescription drug expenses) and other expenses

High prescription drug prices and expenses have drawn much attention and criticism.[6] In addition to lowering prices of prescription drugs by pharmaceutical manufacturers, efficiency improvement of health insurers presents another opportunity to reduce prescription drug expenses. In this current research, DEA models are used to calculate the potential prescription drug cost reductions. The DEA model generates efficient target values for inputs and outputs. The difference

5. In this research, the earned premium refers to the net written premium, net of reinsurance but not taxes or fees. In the sample of this research, generally the reinsurance is of a negligible amount.

6. Aitken et al. (2016) discuss various underlying factors likely to influence prescription drug spending, such as strengthening of the innovation pipeline, consolidation among buyers, and reduced incidence of patent expirations.

between the actual input value and the efficient input target value is the potential cost reductions (or savings) in the input. The efficiency of health insurers can be evaluated from various perspectives, such as the insurers' perspective, the consumers' perspective and the societal perspective (Yang and Lin, 2017). Different perspectives require different inputs and outputs. One of the major objectives of any health care system (including the federal Affordable Care Act [ACA]) is to provide necessary medical services to the maximum number of beneficiaries with reasonable costs. Therefore, this current research adopts the societal perspective to measure the "medical services efficiency" of the health insurer (Brockett et al., 2004; Yang, 2014; Yang and Lin, 2017; Yang and Wen, 2017; Brockett, Golden and Yang, 2018), which evaluates the insurer's performance in minimizing medical costs given the number of covered persons and medical services received (or maximizing the number of covered persons and medical services received given medical costs). Correspondingly, the outputs are the measures of health coverage and medical services provided; and the inputs are the expenses incurred. Specifically, the outputs include enrollment and the utilization of medical services (e.g., ambulatory encounters and hospital patient days), and the inputs are hospital/medical expenses (excluding prescription drug expenses), prescription drug expenses, and other expenses (e.g., quality improvement, claims adjustment and general administrative expenses). The inputs and outputs of the medical services efficiency model are presented in Table 3.

Table 3:
Inputs and Outputs of DEA Efficiency

DEA efficiency models	Inputs	Outputs
Model 1 (net prescription drugs)	Hospital/medical expenses (excluding prescription drugs)	Member months
	Net prescription drug expenses (after rebates)	Ambulatory encounters
	Other expenses (quality improvement, claims adjustment and general administrative expenses)	Hospital patient days
Model 2 (gross prescription drugs)	Hospital/medical expenses (excluding prescription drugs)	Member months
	Gross prescription drug expenses (before rebates)	Ambulatory encounters
	Other expenses (quality improvement, claims adjustment and general administrative expenses)	Hospital patient days

Different from the studies of health insurers' cost reductions in the literature (e.g., Yang and Lin (2017) and Brockett, Golden and Yang (2018)), this current research isolates prescription drug expenses from hospital/medical expenses to analyze the potential cost reductions on prescription drug expenses specifically. The DEA Model 1 uses net prescription drugs after rebates. Because of the proposal of removing the rebates, this current research also examines the potential reductions on gross prescription drugs before rebates (DEA Model 2). DEA Model 2 is utilized

to analyze prescription drug cost reductions if the rebates are not allowed. Prohibiting rebates would have affected premiums or profit margins of health insurers, but not the "set coverage" of medical services (e.g., ambulatory encounters and hospital patient days). Insurers receive rebates after gross prescription drug expenses are incurred. DEA Model 2 actually compares the efficiency on gross prescription drug expenses given the enrollment and medical services. Therefore, the outputs are the same for both DEA Model 1 and DEA Model 2. Instead of using quality improvement, claims adjustment and general administrative expenses as separate inputs, this current research aggregates them to one input "other expenses." This aggregation results in a bigger sample of insurers because insurers with non-positive values in any of the three expenses would have to be excluded otherwise.

Descriptive Statistics and Univariate Analyses

This section presents some descriptive and univariate analyses of premiums, hospital/medical expenses, prescription drug expenses, pharmaceutical rebates, and other expenses for the comprehensive lines and Medicare Advantage. As stated, there are 629 insurers in the comprehensive individual line, 792 insurers in the comprehensive group line, 933 insurers in the whole comprehensive (individual/group) line, and 527 insurers in Medicare Advantage.

Some summary statistics of hospital/medical expenses and net prescription drug expenses are presented in Table 4. On average, hospital/medical expenses (excluding prescription drug expenses) per member year are $3,718 for the whole comprehensive line. Within the comprehensive line, hospital/medical expenses per member year of the comprehensive group line is 10% higher than that of the comprehensive individual line—$3,915.2 versus $3,558.2 (statistically significant, p-value is <0.0001). For Medicare Advantage, the average of hospital/medical expenses per member year is $9,693.6, 160.7% higher than that of the whole comprehensive line.

On average, net prescription drug expenses per member year of the whole comprehensive line are $823.3. Within the comprehensive line, net prescription drug expenses account for 20.1% and 17.5% of the total net medical expenses for the comprehensive individual and group lines, respectively. The average of net prescription drug expenses per member year of the comprehensive group line is 7.2% lower than that of the comprehensive individual line ($820.9 versus $885) (statistically significant, p-value is 0.000). For Medicare Advantage, the average of net prescription drug expenses per member year is $990.5, 20.3% higher than that of the whole comprehensive line. However, net prescription drug expenses of Medicare Advantage only account for 9.2% of its total net medical expenses, in contrast with 18.5% for the whole comprehensive line.

The summary statistics of gross prescription drug expenses and pharmaceutical rebates are presented in Table 5. The average gross prescription drug expenses per

member year is $1,003.7 for the comprehensive individual line, $952.4 for the comprehensive group line, $946.8 for the whole comprehensive line (individual/group), and $1,533.3 for Medicare Advantage. Pharmaceutical rebates of Medicare Advantage are the highest, on average $542.8 per member year, accounting for 35.4% of gross prescription drug expenses.

Table 4:
Summary statistics of hospital/medical expenses (excluding prescription drugs) and net prescription drug expenses

Business line	Hospital/medical expenses (excluding prescription drug expenses) per member year ($)*		Net prescription drug expenses per member year ($)*		Net prescription drug expenses (% of total net medical expenses)	
	Mean	StDev	Mean	StDev	Mean	StDev
Comprehensive individual	3,558.2	1,281.8	885	395.5	20.1%	6.5%
Comprehensive group	3,915.2	979.7	820.9	295	17.5%	5.5%
Comprehensive individual/group	3,718	1,116.8	823.3	320.6	18.5%	5.9%
Medicare Advantage	9,693.6	2,318.2	990.5	460.7	9.2%	3.4%

*The dollar amount is in the 2017 Texas dollar.

Table 5:
Summary statistics of gross prescription drugs (before rebates) and pharmaceutical rebates

Business line	Gross prescription drugs (before rebates) per member year ($)*		Pharmaceutical rebates per member year ($)*		Pharmaceutical rebates (% of gross prescription drugs)	
	Mean	StDev	Mean	StDev	Mean	StDev
Comprehensive individual	1,003.7	447	118.7	89.8	11.6%	6.5%
Comprehensive group	952.4	329.8	131.5	86.1	13.9%	8.3%
Comprehensive individual/group	946.8	356.8	123.5	86.8	13%	8.2%
Medicare Advantage	1,533.3	557.6	542.8	327.7	35.4%	16.7%

*The dollar amount is in the 2017 Texas dollar.

For the comprehensive line, the average pharmaceutical rebates are $123.5 per member year (accounting for 13% of gross prescription drug expenses) for the whole comprehensive line, $118.7 (11.6%) for the comprehensive individual line, and $131.5 (13.9%) for the comprehensive group line. The pharmaceutical rebates

of the comprehensive individual line are 9.7% lower than that of the comprehensive group line ($118.7 versus $131.5) (statistically significant, p-value is 0.003).

Some summary statistics of the earned premium, net prescription drug expenses, and pharmaceutical rebates (relative to earned premiums) are presented in Table 6. On average, the earned premiums per member year are $5,273.8 for the whole comprehensive line. Within the comprehensive line, the earned premium per member year of the comprehensive group line is 10.9% higher than that of the comprehensive individual line ($5,556.9 versus $5,010.4) (statistically significant, p-value is <0.0001). For Medicare Advantage, the average of hospital/medical expenses per member year is $12,329.7, 133.8% higher than that of the whole comprehensive line.

Table 6:
Summary statistics of earned premiums, net prescription drug expenses and pharmaceutical rebates (% of earned premiums)

Business line	Earned premiums per member year ($)*		Net prescription drug expenses (% of earned premiums)		Pharmaceutical rebates (% of earned premiums)	
	Mean	StDev	Mean	StDev	Mean	StDev
Comprehensive individual	5,010.4	1,670.1	17.8%	6%	2.3%	1.5%
Comprehensive group	5,556.9	1,198.3	14.8%	4.6%	2.4%	1.6%
Comprehensive individual/group	5,273.8	1,392.1	15.8%	5.2%	2.4%	1.7%
Medicare Advantage	12,329.7	3,047	8.1%	3.4%	4.4%	2.3%

*The dollar amount is in the 2017 Texas dollar.

Net prescription drug expenses of the whole comprehensive line account for 15.8% of earned premiums, but only 8.1% for Medicare Advantage. The net prescription drug expenses are 17.8% of the earned premium for the comprehensive individual line, significantly higher than that of the comprehensive group line (14.8%) (p-value is <0.0001). Regarding pharmaceutical rebates, they account for 4.4% of the earned premium for Medicare Advantage. Pharmaceutical rebates account for 2.4% of the earned premium for the whole comprehensive line, and 2.3% and 2.4% for the comprehensive individual and group lines, respectively, which are not significantly different (p-value is 0.475).

Other expenses (quality improvement, claims adjustment and general administrative expenses) are one of the inputs of the DEA analysis of this research. Some summary statistics of other expenses are presented in Table 7. On average, other expenses for Medicare Advantage are $1,631.8 per member year, 147.9% higher than that of the whole comprehensive line ($658.2). Other expenses per member year of the comprehensive individual line are 4.8% higher than that of the comprehensive group line ($686.3 versus $655.1) (statistically significant, p-value is 0.02).

Table 7:
Summary statistics of other expenses (quality improvement, claims adjustment and general administrative expenses

Business line	Other expenses per member year ($)*		Other expenses (% of total net expenses)	
	Mean	StDev	Mean	StDev
Comprehensive individual	686.3	289.7	14%	5.4%
Comprehensive group	655.1	280.2	12.4%	5.3%
Comprehensive individual/group	658.2	274.7	13.1%	5.6%
Medicare Advantage	1,631.8	634.1	13.3%	4.2%

*The dollar amount is in the 2017 Texas dollar.

Relative to the total net expenses (hospital/medical expenses, net prescription drug expenses, and other expenses), other expenses account for 13.1% and 13.3% of the total net expenses for the whole comprehensive line and Medicare Advantage. Other expenses account for 14% of the total net expenses for the comprehensive individual line, significantly higher than that of the comprehensive group line (12.4%) (p-value is <0.0001).

Pass-Through of Pharmaceutical Rebates to Premiums

To investigate the impact of pharmaceutical rebates on premiums, this research conducts a series of regression analyses for the four samples of insurers with the comprehensive individual line, the comprehensive group line, the whole comprehensive (individual/group) line, and Medicare Advantage, respectively. The independent variables with very few values are excluded, such as provider service organization (PSO) plans and bonus/withhold – fee-for-services. Additionally, due to the multicollinearity issue, the variables with the variance inflation factor (VIF) bigger than 5 are also excluded, such as contractual fee payments. The regression estimates of the impact of pharmaceutical rebates on the earned premium of each business line are presented in Table 8.[7,8]

7. For robustness checks, the regression and DEA analyses are also conducted on the sub-samples of insurers that remained in the market all three years of the sample time period. Similar results are obtained, so they are not presented in this research. For example, for the sub-samples (459 individual insurers, 672 group insurers, 783 individual/group insurers, and 396 Medicare insurers), the premium increases per member year with a one percentage point decrease in pharmaceutical rebates are $7.3 (individual line), $26.7 (group line), $14.8 (individual/group line) and $14.40 (Medicare Advantage). For the whole sample, the premium increases are $7 (individual line), $24.7 (group line), $15.8 (individual/group line), and $12.9 (Medicare Advantage).

8. For another robustness check and to address the potential endogeneity issue, the regression analysis is also conducted, including an additional explanatory variable, a percentage of incurred

Table 8:
Regression estimates of the effect of pharmaceutical rebates (% of gross prescription drug expenses on earned premiums (per member year)

Variables	Earned premiums (comprehensive individual)	Earned premiums (comprehensive group)	Earned premiums (comprehensive individual/group)	Earned premiums (Medicare Advantage)
Pharmaceutical rebates	-698.83	-2473.69***	-1584.19***	-1292.74*
Size of the insurer	-116.58	12.90	-36.75	738.09***
Big group insurers	81.71	340.08***	296.53***	923.68***
Single insurers	-76.35	-208.54*	-89.62	1696.82***
Single-state insurers	-55.68	177.71*	55.39	437.77*
Stock insurers	-289.10*	-27.32	-259.87***	632.87**
Ambulatory encounters per member year	47.65***	22.80***	23.92***	37.69***
Hospital patient days per member year	318.80	751.85***	311.20	489.56***
Enrollment in the comprehensive individual line		-407.70**	-969.46***	-851.24
Enrollment in the comprehensive group line	1215.53***			-1150.63**
Enrollment in Medicare supplement	526.63	1582.81***	-1.00	2715.64
Enrollment in Federal Employees Health Benefits (FEHB) plans	1120.91	496.93	592.10	1886.41
Enrollment in Medicare Advantage	1022.50**	457.75**	114.33	
Enrollment in Medicaid managed care	167.21	322.98	-1137.59***	1916.46***
Health maintenance organizations (HMOs)				916.02**
Preferred provider organizations (PPOs)	843.93***	335.08***	300.26**	420.59
Point of service (POS)	-446.84	-523.02***	-751.71***	-936.67
Indemnity only	-484.64	81.87	-167.96	-846.38
Capitation payments	522.61	317.97	154.09	1592.49***
Fee-for-service payments	-613.95**	21.95	-217.25	1334.57***
Bonus/withhold - contractual fee payments	709.17	639.73**	480.69	337.36
Non-contingent salaries	-848.46	1012.75	962.95	4585.36*
Aggregate cost arrangements	-2477.11*	-0.89	-654.07	1885.84
Observations	629	792	933	527
R^2	0.49	0.47	0.45	0.66
Adjusted R^2	0.42	0.41	0.41	0.62

Other variables included: year and state dummy variables.
***p<0.01, **p<0.05, *p<0.10.

CMS (2018) examines the impacts of removing pharmaceutical rebates and assumes that 15% of the eliminated rebates would be retained by manufacturers,

claims paid in prescription drugs. Similar results are obtained. The premium increases per member year with a one percentage point decrease in pharmaceutical rebates are $5.8 (individual line), $29 (group line), $18.1 (individual/group line) and $13 (Medicare Advantage). For the whole sample, the premium increases are $7 (individual line), $24.7 (group line), $15.8 (individual/group line) and $12.9 (Medicare Advantage).

75% of the remaining 85% would be converted into chargebacks, and 25% of the remaining 85% (that is, 21% of the eliminated rebates) would be used to lower list prices of prescription drugs. This current research presents the results of four scenarios: none of the eliminated rebates are used to lower list prices (all are retained by manufacturers and/or applied to chargebacks), 25% of the eliminated rebates are used to lower list prices, 50% of the eliminated rebates are used to lower list prices, and 75% of the eliminated rebates are used to lower list prices.

For **the whole comprehensive (individual/group) line**, the regression results indicate that the earned premium per member year increases by $15.8 with a one percentage point decrease in pharmaceutical rebates. On average, pharmaceutical rebates account for 13% of gross prescription drug expenses for the whole comprehensive line (Table 5). If the pharmaceutical rebates are all eliminated but the prescription drug list price is not lowered, the premium of the whole comprehensive line would increase by $205.4 per member year ($1,584 x 13%), or $17.1 per member month. From the insurer's side, using 25% of the eliminated rebates to lower list prices is equivalent to eliminating 75% of the rebates. Therefore, if 25% of the eliminated rebates are used to lower list prices, the premium of the whole comprehensive line would increase by $154.1 per member year ($1,584 x 13% x 75%), or $12.8 per member month. Similarly, if 50% of the eliminated rebates are used to lower list prices, the premium of the whole comprehensive line would increase by $102.7 per member year ($1,584 x 13% x 50%), or $8.6 per member month. If 75% of the eliminated rebates are used to lower list prices, the premium of the whole comprehensive line would increase by $51.4 per member year ($1,584 x 13% x 25%), or $4.3 per member month.

For **the comprehensive individual line**, the regression results indicate that the earned premium per member year increases by $7 with a one percentage point decrease in pharmaceutical rebates. On average, pharmaceutical rebates account for 11.6% of gross prescription drug expenses for the comprehensive individual line (Table 5). If the pharmaceutical rebates are all eliminated but the prescription drug list prices are not lowered, the premium of the comprehensive individual line would increase by $81.1 per member year, or $6.8 per member month. If 25% of the eliminated rebates are used to lower list prices, the premium of the comprehensive individual line would increase by $60.8 per member year, or $5.1 per member month. If 50% of the eliminated rebates are used to lower list prices, the premium of the comprehensive individual line would increase by $40.5 per member year, or $3.4 per member month. If 75% of the eliminated rebates are used to lower list prices, the premium of the comprehensive individual line would increase by $20.3 per member year, or $1.7 per member month.

For **the comprehensive group line**, the regression results indicate that the earned premium per member year increases by $24.7 with a one percentage point decrease in pharmaceutical rebates. On average, pharmaceutical rebates account for 13.9% of gross prescription drug expenses for the comprehensive group line (Table 5). If the pharmaceutical rebates are all eliminated but the prescription drug list price is not lowered, the premium of the comprehensive group line would increase by $343.8 per member year, or $28.7 per member month. If 25% of the eliminated

rebates are used to lower list prices, the premium of the comprehensive group line would increase by $257.9 per member year, or $21.5 per member month. If 50% of the eliminated rebates are used to lower list prices, the premium of the comprehensive group line would increase by $171.9 per member year, or $14.3 per member month. If 75% of the eliminated rebates are used to lower list prices, the premium of the comprehensive group line would increase by $86 per member year, or $7.2 per member month.

For **Medicare Advantage**, the regression results indicate that the earned premium per member year increases by $12.9 with a one percentage point decrease in pharmaceutical rebates. On average, pharmaceutical rebates account for 35.4% of gross prescription drug expenses for Medicare Advantage (Table 5). If the pharmaceutical rebates are all eliminated but the prescription drug list price is not lowered, the premium of Medicare Advantage would increase by $457.6 per member year, or $38.1 per member month. If 25% of the eliminated rebates are used to lower list prices, the premium of Medicare Advantage would increase by $343.2 per member year, or $28.6 per member month. If 50% of the eliminated rebates are used to lower list prices, the premium of Medicare Advantage would increase by $228.8 per member year, or $19.1 per member month. If 75% of the eliminated rebates are used to lower list prices, the premium of Medicare Advantage would increase by $114.4 per member year, or $9.5 per member month.

The premium increases of applying differential amounts of eliminated rebates to lower prescription drug list prices are summarized in Table 9. The potential premium increase of eliminating pharmaceutical rebates is the highest for Medicare Advantage, 122.2% more than that of the whole comprehensive (individual/group) line ($19.1 versus $8.6 per member month if 50% of eliminated rebates are used to lower list prices). The potential premium increase of eliminating pharmaceutical rebates is very small for the comprehensive individual line, only $3.4 per member month if 50% of eliminated rebates are used to lower list prices.

Table 9:
Premium increases (per member month) with differential applications of eliminated rebates to lower list prices

Business line	0% of eliminated rebates are used to lower list prices	25% of eliminated rebates are used to lower list prices	50% of eliminated rebates are used to lower list prices	75% of eliminated rebates are used to lower list prices
Comprehensive individual	$6.8	$5.1	$3.4	$1.7
Comprehensive group	$28.7	$21.5	$14.3	$7.2
Comprehensive individual/group	$17.2	$12.9	$8.6	$4.3
Medicare Advantage	$38.1	$28.6	$19.1	$9.5

Efficiency-Based Potential Cost Reductions

Reducing health expenditures (including prescription drug expenses) is a shared responsibility among all the stakeholders. Besides the attempts to lower prescription drugs prices by pharmaceutical manufacturers, insurers should also try to reduce prescription drug expenses through efficiency improvement. Using the DEA efficiency models, this section examines the potential cost reductions on prescription drug expenses; hospital/medical expenses; and other expenses, including quality improvement, claims adjustment and general administrative expenses. Specifically, the input-oriented constant returns-to-scale (CRS) DEA model is adopted in this research to obtain DEA efficiency scores and efficient inputs (Brockett, Golden and Yang, 2018). The difference between the actual input value and the efficient input target value is the potential cost reductions (or savings) in the input.

The DEA optimization problems are solved by using the DEA software developed by Joe Zhu (Zhu, 2009). Similar to Yang and Wen (2017), it is not realistic to expect the insurers to be the most efficient in the whole sample. Therefore, the median efficiency of each sample is selected as the efficiency goal for less efficient insurers. Firstly, the DEA model is run on all the insurers of each line to get their efficiency scores. The DEA model is then applied to the insurers at or below the median efficiency to obtain the efficient input target values and hence the potential cost reductions. The insurers above the median efficiency are unnecessary to reduce costs/expenses. For example, to get the potential cost reductions for Medicare Advantage, firstly the DEA model is run on the 527 Medicare Advantage insurers. The median efficiency of the 527 Medicare Advantage insurers is 0.6846. The DEA model is then applied to the 264 Medicare Advantage insurers with an efficiency score at or below 0.6846 to obtain their efficient inputs.

This research analyzes the potential cost reductions on both net prescription drug expenses and gross prescription drug expenses. The potential cost savings using DEA Model 1 (with net prescription drug expenses as one of the inputs) are presented in Table 10. Using the median efficiency as the goal, the potential cost savings on net prescription drug expenses are $6.5 per member month for the whole comprehensive (individual/group) line, $8.5 for the comprehensive individual line, $6.2 for the comprehensive group line, and $8.5 for Medicare Advantage. These potential cost reductions on prescription drug expenses are enough to offset the potential premium increases from eliminating pharmaceutical rebates for the comprehensive individual line. However, they may not be sufficient for the whole comprehensive line, the comprehensive group line, or Medicare Advantage, depending on the amount of the eliminated rebates being used to lower prescription drug list prices. For example, if 50% of the eliminated rebates are used to lower list prices, the potential premium increases of Medicare Advantage are $19.1 per member month (Table 9), while the potential cost reductions on prescription drug expenses are only $8.5 per member month.

Table 10:
Potential cost reductions on hospital/medical expenses, net prescription drug expenses (after rebates), and other expenses

Business line		Hospital and medical expenses (excluding prescription drugs)		Net prescription drug expenses		Quality improvement, claims adjustment and general administrative expenses	
		$ per member month	% of earned premiums	$ per member month	% of earned premiums	$ per member month	% of earned premiums
Comprehensive individual	Mean	32.7	6.1%	8.5	1.6%	6.9	1.4%
	StDev	57.6	10.2%	15.7	2.7%	13.8	3.6%
Comprehensive group	Mean	27.1	5.3%	6.2	1.2%	5.8	1.2%
	StDev	44	8.2%	10.7	2.1%	11.5	2.3%
Comprehensive individual/group	Mean	27.6	5.4%	6.5	1.3%	5.9	1.2%
	StDev	47.3	9%	12.6	2.2%	11.5	2.3%
Medicare Advantage	Mean	56.2	4.2%	8.5	0.7%	12.1	1%
	StDev	122	7.7%	21.5	1.7%	28.5	2.4%

Nonetheless, the total cost reductions on hospital/medical expenses, prescription drug expenses, and other expenses (quality improvement, claims adjustment and general administrative expenses) are always more than enough to offset any potential premium increases for all the business lines, no matter how much of the eliminated rebates are used to lower prescription drug list prices. Specifically, the total potential cost reductions based on the median efficiency objective are $40 per member month for the whole comprehensive (individual/group) line, $48.1 for the comprehensive individual line, $39.1 for the comprehensive group line, and $76.8 for Medicare Advantage, in contrast with the respective potential premium increases of $17.2 (whole comprehensive line), $6.8 (comprehensive individual line), $28.7 (comprehensive group line) and $38.1 (Medicare Advantage) when none of the eliminated rebates are used to lower prescription drug list prices (Table 9).

Insurers receive pharmaceutical rebates after gross prescription drug expenses are incurred. Therefore, it is reasonable to also evaluate the potential cost reductions on gross prescription drug expenses, which actually apply to "the scenario when none of the eliminated rebates are used to lower prescription drug list prices." The potential cost savings using DEA Model 2 (with gross prescription drug expenses as one of the inputs) are presented in Table 11. The results show that based on the median efficiency goal, the potential cost reductions on gross prescription drug expenses are $7.1 per member month for the whole comprehensive (individual/group) line, $9.6 for the comprehensive individual line, $6.7 for the comprehensive group line, and $11.1 for Medicare Advantage, in contrast with the respective cost reductions on net prescription drug expenses of $6.5 (whole comprehensive line), $8.5 (comprehensive individual line), $6.2 (comprehensive group line), and $8.5 (Medicare Advantage). The potential cost reductions on hospital/medical expenses and other expenses are almost the same under the two DEA models.

Table 11:
Cost reductions of hospital and medical expenses, gross prescription drug expenses (before rebates), and other expenses

Business line		Hospital and medical expenses (excluding prescription drugs)		Gross prescription drug expenses		Quality improvement, claims adjustment and general administrative expenses	
		$ per member month	% of earned premiums	$ per member month	% of earned premiums	$ per member month	% of earned premiums
Comprehensive individual	Mean	34.1	6.4%	9.6	1.8%	6.8	1.4%
	StDev	58.5	10.4%	17.3	2.9%	13.4	3.5%
Comprehensive group	Mean	27.1	5.3%	6.7	1.3%	5.9	1.2%
	StDev	43.8	8.2%	11	2.1%	11.7	2.3%
Comprehensive individual/group	Mean	27.2	5.4%	7.1	1.4%	5.9	1.2%
	StDev	46.6	8.9%	13	2.3%	11.5	2.3%
Medicare Advantage	Mean	54.3	4.2%	11.1	0.9%	12.7	1%
	StDev	106.5	7.1%	24.2	1.8%	28.8	2.4%

Conclusion

High prescription drug costs are a persistent issue with consumers and policymakers. One of the top priorities of the Trump Administration is to reduce the price of prescription drugs. The "American Patients First" blueprint of the HHS introduces a comprehensive plan to lower drug prices and reduce OOP costs. Furthermore, the HHS issued a proposed rule to eliminate manufacturer rebates to plan sponsors under Medicare Part D and Medicaid MCOs. Even though the proposed rule was withdrawn, it raised the question of how pharmaceutical rebates affect all the stakeholders, and it also drew more attention to necessitated regulatory reforms to reduce prescription drug expenses. This research investigates the pass-through of manufacturer pharmaceutical rebates to premiums, examines the potential cost reductions on prescription drug expenses through efficiency improvement, and aims to inform the public and provide insights to all the stakeholders on the treatment of manufacturer pharmaceutical rebates and prescription drug cost savings.

The descriptive analyses show that net prescription drug expenses per member year of the comprehensive group line are significantly lower than that of the comprehensive individual line. The net prescription drug expenses per member year of Medicare Advantage are higher in the dollar amount than the comprehensive lines; however, they account for the smallest percentage of the total medical expenses (9.2%) or the total premium (8.1%) (18.5% and 15.8% for the whole comprehensive line). The average pharmaceutical rebates account for 13% of gross prescription drug expenses and 2.4% of the total premium for the whole comprehensive line. Pharmaceutical rebates of Medicare Advantage are much higher, accounting for 35.4% of gross prescription drug expenses and 4.4% of the

total premium. The pharmaceutical rebates of the comprehensive individual line are significantly lower than that of the comprehensive group line.

The regression results indicate that the premium per member month increases by $1.3 with a one percentage point decrease in pharmaceutical rebates (as a percentage of gross prescription drug expenses) for the whole comprehensive line, and $1.1 for Medicare Advantage. The potential premium increase of eliminating pharmaceutical rebates is the highest for Medicare Advantage, 122% more than that of the whole comprehensive line. Specifically, by eliminating all pharmaceutical rebates but using 50% of the eliminated rebates to lower prescription drug list prices, the premium per member month would increase by $8.6 for the whole comprehensive line, and $19.1 for Medicare Advantage.

Using the median efficiency as the efficiency goal, the potential cost savings on net prescription drug expenses are $6.50 per member month for the whole comprehensive line, and $8.5 for Medicare Advantage. These potential cost reductions on prescription drug expenses may not be sufficient to offset the potential premium increases from eliminating pharmaceutical rebates for the whole comprehensive line or Medicare Advantage, depending on the amount of the eliminated rebates being used to lower prescription drug list prices. Nonetheless, the total cost reductions on hospital/medical expenses, prescription drug expenses, and other expenses (quality improvement, claims adjustment and general administrative expenses) are always more than enough to offset any potential premium increases for all the business lines, no matter how much of the eliminated rebates are used to lower prescription drug list prices. Specifically, the total potential cost reductions based on the median efficiency objective are $40 per member month for the whole comprehensive line, and $76.8 for Medicare Advantage, in contrast with the respective potential premium increases of $17.2 (whole comprehensive line), and $38.1 (Medicare Advantage) when none of the eliminated rebates are used to lower prescription drug list prices.

The findings of this research imply that policymakers and state insurance regulators may remove pharmaceutical rebates to reduce list drug prices and consumers' OOP costs, but simultaneously they should initiate innovative policy and regulatory changes to improve the efficiency of health insurers, reduce their expenses, and offset the potential premium increases. Alternatively, the policymakers and state insurance regulators may still keep pharmaceutical rebates in place but utilize the cost savings from efficiency improvement to reduce the consumers' OOP costs.

Appendix:
Description of Independent Variables

Variables		Description
Pharmaceutical rebates		Pharmaceutical rebates (% of gross prescription drug expenses)
Size of the insurer		Logarithm of member months
Big group insurers		Dummy, 1 for insurers affiliated with the top 5 groups and 0 for others
Single insurers		Dummy, 1 for unaffiliated insurers and 0 for others
Stock insurers		Dummy, 1 for stock insurers and 0 for others
Single-state insurers		Dummy, 1 for single-state insurers and 0 for others
Ambulatory encounters		Ambulatory encounters per member year
Hospital patient days		Hospital patient days per member year
Payment methods	Capitation payments	Capitation payments (% of total payments)
	Contractual fee payments	Contractual fee payments (% of total payments)
	Fee-for-service payments	Fee-for-service payments (% of total payments)
	Bonus/withhold – fee-for-service	Bonus/withhold – fee-for-service-payments (% of total payments)
	Bonus/withhold – contractual fee payments	Bonus/withhold – contractual fee payments (% of total payments)
	Non-contingent salaries	Non-contingent salaries (% of total payments)
	Aggregate cost arrangements	Aggregate cost arrangements (% of total payments)
Product types	Health maintenance organizations (HMOs)	HMO enrollment (% of total enrollment)
	Provider service organizations (PSOs)	PSO enrollment (% of total enrollment)
	Preferred provider organizations (PPOs)	PPO enrollment (% of total enrollment)
	Point of service (POS)	POS enrollment as % of total enrollment
	Indemnity only	Indemnity enrollment (% of total enrollment)
Business lines	Enrollment in the comprehensive individual line	Comprehensive (individual) enrollment (% of total enrollment)
	Enrollment in the comprehensive group line	Comprehensive (group) enrollment (% of total enrollment)
	Enrollment in Medicare supplement	Medicare supplement enrollment (% of total enrollment)
	Enrollment in Federal Employees Health Benefits (FEHB) plans	FEHB plan enrollment (% of total enrollment)
	Enrollment in Medicare Advantage	Medicare Advantage enrollment (% of total enrollment)
	Enrollment in Medicaid managed care	Medicaid managed care enrollment (% of total enrollment)
Year (Y2015, Y2016, Y2017)		Year dummy variables, year 2015 is the reference year
State		State dummy variables

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Too Close for Comfort: Diminished Effectiveness of Ratio-Based Solvency Monitoring When Insurers Are Located Close to Their State Insurance Regulators

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Abstract

Prior research suggests that monitors (e.g., analysts, investors, auditors and regulators) perform better when they are located close to the companies they inspect. The improved performance is generally attributed to a greater availability of soft information about a company's financial condition when companies and monitors are close. We identify a setting where proximity may result in diminished performance. We investigate the effect of proximity between insurers and regulators on insurer earnings management. Insurance regulators use a multistep process to monitor insurer solvency. In the initial phase, regulators compute ratios and prioritize financially weak insurers for more detailed scrutiny. Regulators are more likely to obtain and use soft information about insurers after the initial phase. The ratio-based initial phase gives insurers incentives to under-reserve to improve their financial ratios and potentially avoid prioritization for additional scrutiny.

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Consistent with prior research, we report that financially weak insurers tend to under-reserve. Incremental to prior research, we find that financially weak insurers located close to regulators under-reserve more than weak ones not located near regulators. Our results suggest that a multistep inspection process that begins with ratios may lead to more earnings management among financially weak companies, especially if they are close to their monitor.

Introduction

Prior research reports that analysts, investors, auditors and regulators tend to perform better when they are located close to the firms they monitor. Analysts make more accurate earnings forecasts (Malloy, 2005; Bae, Stulz and Tan 2008; Jennings, Lee and Matsumoto, 2017), investors generate higher returns (Coval and Moskowitz, 1999, 2001; Ivkovic and Weisbenner, 2005; Baik, Kang and Kim, 2010), auditors perform higher quality audits and deter more client earnings management (Choi, Kim, Qui and Zang, 2012; Jensen, Kim and Yi, 2015; DeFond, Francis and Hallman, 2018), and regulators more effectively constrain aggressive financial reporting (Kedia and Rajgopal, 2011; Chhaochharia, Kumar and Niessen-Ruenzi, 2012). The improved performance is generally attributed to a greater availability and use of soft information about the firm being monitored.

We identify a setting where geographical proximity may result in a diminished performance by monitors rather than improved performance. A unique feature of the property/casualty (P/C) insurance industry is its multistep solvency monitoring process. In the initial phase of examination, personnel working for the National Association of Insurance Commissioners (NAIC) compute ratios belonging to the Insurance Regulatory Information System (IRIS).[1] NAIC examiner teams review insurers' ratios looking for unusual and unexpected results that might be a red flag about a given insurer's financial condition. They prioritize insurers for more detailed scrutiny and give their recommendations to state insurance departments for their consideration.[2] Soft information about an insurer is more likely to be available to and used by regulators when state insurance regulators conduct their investigations of insurers. Therefore, financially weak insurers have incentives to manage their annual report data in a manner that improves the ratios regulators use to prioritize them for further scrutiny. Prior research provides evidence that financially weak insurers, measured relative to IRIS ratios, engage in earnings management in manners that portray their financial positions more favorably (Petroni 1992; Gaver and Paterson 2004). Specifically, financially weak insurers under-reserve for losses, which overstates their reported earnings and policyholders' surplus while understating their liabilities and losses. Regulators attempt to reduce insurer under-reserving. We extend this line of research by investigating the effect of the geographical proximity between insurers and regulators on insurer earnings management.

1. Insurance regulators use a variety of tools, including risk-based solvency surveillance (Klein, 2009). For reasons explained in section 2.1, we focus on the Insurance Regulatory Information System (IRIS) ratios.

2. The initial phase is largely performed by analyst teams that include financial examiners representing all zones of the National Association of Insurance Commissioners (NAIC). After the initial phase, regulatory scrutiny is performed by state insurance regulators, meaning examiners performing the latter phase of analysis are generally more local to the insurer than examiners performing the initial ratio-based analysis.

Soft information, such as information obtained from personal contacts, is more likely to be better and of higher quality when the frequency of contact is greater. Prior research posits that personal contact is more likely to occur (and likely to occur in meaningful manners) when monitors and companies are located in close proximity (Stein, 2002; Liberti and Petersen, 2019; Choi et al., 2012; Tang and Wu, 2012; Jaggi and Tang, 2014). Although soft information may be favorable or unfavorable, soft information is more likely to be unfavorable for financially weak companies. Where unfavorable soft information exists, financially weak insurers have incentives to prevent regulators from obtaining it. In other words, financially weak companies potentially have greater incentives to prevent regulators from benefiting from soft information. We investigate whether financially weak insurers located close to regulators are more likely to under-reserve than financially weak ones not located close to regulators.

Using a large sample of insurers from 1993–2013, we empirically examine the relation between insurers' loss reserve errors and their proximity to their state of domicile's insurance regulator. We report statistically significant evidence that financially weak insurers under-reserve and that under-reserving by financially weak insurers is higher if the insurer is located close to their regulator. In contrast, we find evidence that the location of financially healthy insurers relative to their regulators has little, if any, effect on their financial reporting.

Our study is unique in that we provide evidence that conditions under which insurers operate can lead to proximity hindering the effectiveness of monitoring. We suggest this outcome is an unintended consequence, and it is associated with features of the insurance industry's regulatory environment. Specifically, a multistep solvency evaluation of insurers that begins with using ratios to prioritize firms for subsequent steps of investigation gives companies incentives to manage their ratios. Given that soft information is more likely to be used after the initial ratio-based phase, the multistep process gives companies located close to their regulators a higher incentive to manage their ratios because doing so might help the companies most susceptible to harmful soft information prevent regulators from using it.

We organize our paper in the following manner. Section 2 discusses aspects of the insurance industry's regulatory environment and summarizes prior research that investigates the effects of monitors being close to companies. Section 3 describes our research hypothesis. Section 4 describes our sample selection process. Section 5 presents our empirical results. Section 6 concludes.

Motivation

Regulatory Environment of P/C Insurers

The P/C insurance industry is a highly regulated industry, and it has been for more than 100 years. State insurance departments, rather than the federal

government, monitor insurers' solvencies.[3] Each state operates its own state insurance department. To encourage uniformity and to promote efficiency among the states, state insurance commissioners jointly created the NAIC. In its initial meeting in 1871, the NAIC adopted a uniform annual statement. All 50 states have adopted that annual statement format. Since its inception, the NAIC has created several model regulations, with states usually adopting them with little, if any, modification.

Insurance company solvency regulation has been rather successful, and it has evolved to address challenging circumstances. After the number of insurer insolvencies increased in the 1980s (AM Best, 1991), the NAIC passed regulatory reforms. These reforms included making independent annual audits mandatory, establishing and operating a financial regulation accreditation program, and instituting risk-based capital (RBC) reporting requirements. All of these measures were designed to improve the solvency monitoring of insurers. More recently (2007–2008), a U.S. stock market crash initiated a financial crisis that involved many large financial institutions. The governmental response to that crisis occurred largely at the federal level. Federal legislation included the federal Dodd-Frank Wall Street Reform and Consumer Protection Act. Despite federal laws affecting insurers, particularly life and health insurers, P/C insurers solvency regulation largely remains regulated by the states.[4]

With states regulating insurance company solvency and each state regulating all of the insurers licensed to conduct business in their states, many insurers are subject to oversight by multiple jurisdictions simultaneously. Because regulators' resources are limited, the regulators in states where an insurer is merely licensed generally rely on the insurer's state of domicile regulator to monitor the insurer's solvency and inform them of insurers' poor financial conditions.[5] The regulator in the insurer's state of domicile is considered to be the primary regulator. To further increase the cost efficiency and effectiveness of insurer solvency monitoring, the NAIC developed a ratio-based early warning system in the early 1970s. This system is called IRIS. All 50 states have adopted the NAIC's model law for IRIS, and it remains in use nearly five decades later. Virtually all insurers must submit their statutory annual reports to the NAIC, and the NAIC computes each insurer's IRIS ratios based on the insurers' statutory annual reports. (See Appendix A for details

3. The supremacy of state insurance regulation over federal regulation received support from the U.S. Supreme Court in Paul v. Virginia, 75 U.S. 168 (1869). It was reaffirmed by that passage of the federal McCarran-Ferguson Act in 1945. That Act states that the regulation of the business of insurance shall be by the state governments as a matter of public interest. Further, it states that no federal law should be construed to invalidate, impair or supersede any law enacted by any state government for the purpose of regulating the business of insurance, unless the federal law specifically relates to the business of insurance.

4. Dodd-Frank's Title IV created the Federal Insurance Office (FIO) and chartered it with the responsibility of monitoring all aspects of the insurance industry. Dodd-Frank also created the Financial Stability Oversight Council (FSOC), charging it with monitoring insurers.

5. GAO/GGD-00-198 Insurance Regulation: Scandal Highlights Need for Strengthened Regulatory Oversight.

regarding IRIS ratios.) The NAIC also determines the number of IRIS ratios for each insurer it deems to be unusual, and its analyst teams perform some preliminary analyses and provide this information to state insurance departments with their recommendation for prioritization for additional, detailed regulatory scrutiny to be performed by the state insurance departments.[6] Since 1988, insurers' IRIS results have been published annually (Klein, 2009). The ratios, and their bounds, are well-known by regulators, insurers and others.

Petroni (1992) provides empirical evidence that P/C insurers reporting unusual values for the subset of non-reserve IRIS ratios tend to under-reserve relative to other insurers. Gaver and Paterson (2004) confirm and expand upon her research measuring insurers' IRIS ratios on a pre-managed basis where the effects of insurers' loss-reserve errors have been purged from their annual report data. They examine the full set of IRIS ratios and determine that insurers considered to be financially weak on a pre-managed or ex ante basis tend to under-reserve compared to even ones considered to be financially weak on a post-managed or ex post basis. These results suggest that some insurers appear to avoid prioritization for additional regulatory scrutiny. Despite potential limitations in the early warning system, state insurance regulators continue to use IRIS ratios as part of their insurer solvency monitoring. The NAIC has also placed strong emphasis on enhancing a risk-based approach to regulatory solvency surveillance (Klein, 2009). Hoyt and McCullough (2010) identify a disadvantage associated with using RBC measures to measure insurers' pre-managed or ex ante incentives to engage in earnings management. They note that researchers are unable to adjust the RBC ratio for insurers' reserve errors, making it impossible to identify whether the insurer would have failed the RBC requirements without reserve mis-estimation. In contrast, IRIS ratios can be adjusted to their pre-managed levels for academic research purposes.

6. From the NAIC's instructions for the Insurance Regulatory Information System (IRIS) instruction manual (italics added):

> *IRIS, developed by state insurance regulators participating in NAIC committees, is intended to assist state insurance departments in targeting resources to those insurers in greatest need of regulatory attention*. IRIS is not intended to replace each state insurance department's own in-depth solvency monitoring efforts, such as financial analyses or examinations. This Manual is designed to assist state insurance departments and the public in understanding two of the key tools within IRIS: the IRIS Ratios and the Analyst Team System.
>
> One of the most difficult tasks facing insurance regulators is to make effective use of limited resources. All insurers are required to file financial statements with all of the states in which they are licensed to operate. *No state is able to thoroughly review the financial condition of all licensed insurers immediately upon receipt of the financial statements. IRIS helps by providing solvency tools and databases that highlight those insurers that merit the highest priority in the allocation of the regulators' resources, thus directing those resources to the best possible use*.

Prior Research on the Effects of Monitors' Proximity to Companies

An extensive literature has developed examining whether a monitor's proximity to a company it scrutinizes affects the monitor's performance. This body of research investigates the performance of a wide variety of monitors, including analysts, investors, auditors and regulators. Prior research hypothesizes and reports empirical evidence that closer is better. Several studies provide evidence that analysts' forecast errors are smaller for the companies close to them compared to others located farther (e.g., Malloy, 2005; Bae et al., 2008; Jennings et al., 2017). Not only are forecast errors smaller, but analysts' portfolios vary systematically based on their proximity to companies. Analysts monitor a larger number of companies when they are close to the companies they monitor apparently because the cost of staying informed is lower when the companies they monitor are close (Jennings et al. 2017). Similarly, investors benefit from being located close to companies. Individual investors and mutual funds both generate higher investment returns when they are investing in the firms located in their vicinity (Coval and Moskowitz, 1999, 2001; Ivkovic and Weisbenner, 2005; Baik et al., 2010; Ayers, Ramalingegowda and Yeung, 2011). Ayers et al. (2011) also reports that companies exercise less discretion in their financial reporting (measured as less abnormal accruals) when institutional investors are nearby. Auditors produce a similar outcome when they are close. Companies located near their auditors are less likely to engage in earnings management (Choi et al., 2012; Jensen et al., 2015). Similarly, regulators located near the companies they monitor affect those companies' financial reporting (Kedia and Rajgopal, 2011). Kedia and Rajgopal (2011) determine that companies located close to one of the U.S. Securities Exchange Commission's (SEC) offices are less likely to subsequently restate their financial reports. In sum, monitors perform better when they are located close to the firms they monitor, and their performance includes measurable improvements in companies' financial reporting.

The improvements in performance associated with proximity are generally attributed to the availability and use of soft information when companies are located close to the monitor. Soft information tends to be difficult to convey except directly. The person receiving soft information needs to be close to the person who is the source of the information and may require personal observation and face-to-face interactions (Stein, 2002; Liberti and Petersen, 2019). Soft information might be obtained in official meetings with company personnel or informal encounters with firm personnel or others who have personal knowledge about the company's inner workings, prospects, risks and financial conditions (Choi et al., 2012; Tang and Wu, 2012; Jaggi and Tang, 2014). Examples of potentially relevant soft information could include information about the quality of a company's personnel and their morale; changes (and possible changes) in personnel; and changes (and possible changes) in customer relations, supplier relations and creditor relations. Soft information can lead to a better understanding of the company's corporate culture (Tang and Wu, 2012).

Geographical distance is expected to impose significant barriers on the availability of soft information. In fact, there is a common perception that proximity

should be measured using a dummy variable to distinguish whether closeness exists rather than measuring proximity with a continuous measure of distance between a company and its monitor (Coval and Moskowitz, 1999, 2001; Malloy, 2005; Uysal, Kedia and Panchapagesan, 2008; Kedia and Rajgopal, 2011). A common measure of proximity distinguishes whether monitors are within 100 kilometers of the company. Another uses a shorter distance, such as being located in the same metropolitan statistical area. Using either of these measures, prior research examining the effects of distance between monitors and companies suggests that monitors perform better, and attribute it to soft information being more likely to be available to monitors when they are located close to the company and used by them to improve their evaluations, oversight and influence over the companies they monitor. Influence is notable because it suggests monitors' effectiveness affects companies. Investors', auditors' and the SEC's proximity to companies have been associated with less earnings management by the firms being monitored. Those studies suggest that engaging in less earnings management is a rational response when monitors are located close to those companies being monitored because soft information helps monitors identify misreporting, especially when it is occurring in the vicinity.

Hypotheses

We investigate whether P/C insurers' propensities to engage in earnings management are affected by their being headquartered close to their state of domicile's state insurance commissioner's headquarters. Whereas prior research examining the effects of proximity to regulators finds a positive effect to closeness, the settings previously studied involve monitors who use soft information about the companies whenever it is available. In a P/C insurer setting, insurance regulators use ratios to help them prioritize insurers for more detailed scrutiny. Ratios are computed and used rather mechanically. State insurance regulators may be more inclined to use soft information about an insurer's financial condition when performing more detailed additional regulatory scrutiny. Soft information about an insurer's financial condition is likely more readily available to regulators if the insurer is located close to the regulator. In such circumstances, financially weak insurers located close to their regulators may have a larger incentive to engage in earnings management to overstate their ratio results. Improving their reported financial results may delay or avoid additional scrutiny. If the insurer is subject to detailed scrutiny, under-reserving may improve their reported financial results in a manner that helps the insurer withstand initial inspection. The type of earnings management we examine is well-documented among P/C insurance companies: loss reserve mis-estimation. Prior research reports that insurers deemed to be weak due to their IRIS ratios tend to under-reserve (Petroni, 1992; Gaver and Paterson, 2004). An unanswered question is whether financially weak insurers engage in more or less earnings management if they are located close to their state of domicile insurance

regulator. Given prior research examining non-insurers, weak insurers may be less likely to engage in earnings management if they are close to regulators. However, features of the insurance industry's regulatory environment suggest that effect may be mitigated, eliminated and reversed. Rather than impose a restriction on which direction is predicted a priori, we test the following null hypothesis using a two-tailed test.

H1: Financially weak P/C insurer loss reserve errors are not associated with whether they are located close to their state of domicile's insurance regulator.

Data

Sample Section

The initial sample consists of 57,362 P/C insurer firm-year observations collected from years 1993 through 2013.[7] For a firm-year observation to be retained for analysis, we require that the insurer is domiciled within the U.S. and organized as either a stock company or a mutual company. The insurer must have loss reserves subject to managerial discretion. For this reason, we screen observations if the insurer engages in a pooling arrangement or cedes all of its premiums. We also delete observations if the insurer writes more than 25% of premiums for surety and credit or if the insurer writes more than 25% of premiums for reinsurance, accident and health (A&H), or workers' compensation.[8] Finally, we drop observations where the insurer lacks sufficient data to measure variables required by the model we describe and estimate in section 5.[9] We eliminate observations where total adjusted capital (TAC) was below 100% of the authorized control level (ACL). Insurers below this threshold are in a control level (i.e., either the ACL or mandatory control level), and we screen insurers in liquidation or conservatorship. The final sample consists of 18,007 firm-year observations. We summarize our sample selection in Table 1.

7. Source: National Association of Insurance Commissioners (NAIC), by permission. The NAIC does not endorse any analysis or conclusions based upon the use of its data.

8. We apply these screens for consistency with prior research (e.g., Petroni 1992). Petroni (1992) explains that in a pooling arrangement, an insurer submits all premiums to an affiliate, which then allocates premiums and losses across all insurers in the pool, and dictates reserve levels. Firms that cede all of their premiums do not have reserves. Insurers that specialize in surety and credit, reinsurance, accident and health (A&H), or workers' compensation tend to have less discretion in reporting reserves compared to property/casualty (P/C) insurers.

9. To be included in our sample, data are required for the current year, five-year development data, and data from the two most recent prior years to compute IRIS ratios. Thus, our 1993–2013 investigation period requires data from 1991–2018.

Table 1:
Sample Selection

Property/casualty (P/C) insurance companies filing statutory annual reports with the NAIC in 1993–2013[a]		57,362
Less:		
Insurers domiciled outside of the U.S.	627	
Insurers not organized as stock companies or mutuals	6,060	
Insurers with pooling arrangements	9,320	
Insurers that cede all premiums to other insurers	1,941	
Insurers that write more than 25% of their premiums for surety and credit lines of insurance	1,776	
Insurers that write more than 25% of their premiums for reinsurance, accident and health, or workers' compensation	5,297	
Insurers with insufficient data to estimate equation (1)[b]	14,170	
Insurers with risk-based capital (RBC) in the authorized control level or mandatory control level and insurers receivership or liquidation	164	
		(39,355)
Final Sample		18,007

a. All 50 states have adopted the NAIC's *Annual Financial Reporting Model Regulation* (#205). Under this regulation, almost all insurers are required to submit statutory annual reports to their state of domicile's state insurance department. Insurers also submit their statutory annual reports to the NAIC, and the NAIC compiles them into a database.

b. In order to be retained in the sample, data is required for the current year and for two years prior to the current year to compute Insurance Regulatory Information System (IRIS) ratios and five years after the current year to compute ERROR based on a five-year loss reserve development.

Variable Definitions and Descriptive Statistics

For each insurer-year observation, we measure a five-year reserve error or mis-estimation. Our reserve error is the difference between the insurer's original loss reserve and the revised reserve the insurer reports five years after the original year. We gather data for this measure from Schedule P of insurers' statutory annual reports. In Table 2, we provide an example. AIG Casualty Company reported reserves of $4,398,966 in 2018, but it needed to revise its estimated upward. After five years of development, it revised its estimate to $4,804,212. These figures indicate that the insurer under-reserved in 2008 by $405,246. Using a five-year loss reserve development to measure loss reserve errors is consistent with Petroni (1992); Beaver, McNichols and Nelson (2003); Gaver and Paterson (2004); and Grace and Leverty (2010). We scale the five-year loss reserve error by admitted assets as of the end of the year prior to the original loss year in order to control for insurer firm size. The five-year reserve error is positive if the manager initially

under-reserved and subsequently adds to reserves, and it is negative if the manager initially over-reserved and subsequently reduced reserves.

Table 2:
Summary of Estimated Incurred Losses Reported at Year-End, AIG Casualty Company[a]

Estimated incurred losses at year-end

Accident Year	1 2004	2 2005	3 2006	4 2007	5 2008	6 2009	7 2010	8 2011	9 2012	10 2013	
1. Prior	785,070	1,089,68	1,163,22	1,209,35	**1,273,87**	1,378,66	1,536,04	1,556,88	1,563,04	**1,582,41**	
2. 2004	604,198	5	8	4	7	9	8	2	2	7	
3. 2005		498,133	490,614	488,231	**476,996**	484,312	494,191	495,052	497,644	**495,851**	**$4,804,212**
4. 2006		668,478	614,464	603,456	**587,635**	588,634	596,375	593,479	594,676	**599,432**	
5. 2007			700,426	660,691	**636,312**	638,657	652,699	646,773	648,116	**643,080**	
6. 2008				701,632	**686,210**	677,905	711,036	709,818	716,889	**713,727**	
7. 2009					**737,936**	745,124	768,465	759,732	768,329	**769,705**	
8. 2010						586,886	602,740	605,623	608,606	616,628	
9. 2011							503,633	529,306	534,034	524,243	
10. 2012								525,199	538,178	550,220	
11. 2013									488,349	494,861	
										415,380	
					$4,398,966						

a. Excerpted from Schedule P, Part 2, of the 2013 AIG Casualty Company Annual Statement, prepared according to Statutory Accounting Principles. All dollar amounts are in thousands.

In Table 3, we report descriptive statistics for our study's variables, including insurers' scaled five-year reserve errors (*ERROR*). The full sample's mean and median *ERROR* are -0.0167 and -0.0130, respectively. The negative values indicate over-reserving in the original loss year. The mean indicates that insurers initially over-estimated reserves, on average, by 1.67% of lagged admitted assets. The median indicates that the median firm over-reserved by 1.3% of lagged admitted assets. Univariate descriptive statistics (untabulated) indicate that our investigation period includes periods when our sample insurers over-reserved, on average (1993–1999), as well as periods when it under-reserved (2000–2002) and returned to over-reserving (2003–2013). This variation in reserve errors provides a natural control for exogenous industry trends, including cyclicality associated with insurance markets, and allows us to better determine the influence of financial weakness and distance between insurers and regulators on insurers' loss reserve estimates.

We include a measure of insurer financial condition to identify which insurers are most likely to under-reserve. This financial condition measure we use is based on insurers' IRIS ratios. State insurance commissioners use IRIS ratios when they monitor insurer solvency. Insurers can overstate their financial condition by improving their IRIS ratios through under-estimating losses and loss reserves. Since the IRIS ratios and their bounds are known by insurers, and under-reserving tends to improve the reported values for IRIS ratios, financially weak insurers have incentives to under-reserve. Prior research provides evidence that financially weak insurers, as defined by their IRIS ratios, tend to understate their reserves (Petroni, 1992; Gaver and Paterson, 2004). Similar to Gaver and Paterson (2004), we compute insurers' pre-managed IRIS ratios and determine the number of unusual IRIS ratios on a pre-managed basis. We determine this number for each firm-year observation by purging insurers' reported results by their five-year loss reserve

errors and computing IRIS ratios using insurers' purged annual report data. This procedure produces the number of IRIS ratios that the insurer would have reported as unusual if it had reported its original losses equal to the revised losses five years later than the original loss year.[10] We classify an insurer as ex ante financially weak (WEAK) if it has four or more pre-managed IRIS ratios with results outside of the bounds considered normal by the NAIC.[11] We select this cut-off because it usually triggers more detailed regulatory attention by state insurance commissioners (Belth, 1987; Petroni, 1992; NAIC, 1994; Troxel and Bouchie, 1995; Gaver and Paterson, 2004). As shown in Table 3, approximately 17.6% of our sample firm-year observations are coded as financially weak.

Our study primarily focuses on whether proximity between insurers and regulators affects insurers' loss reserve estimates, especially among financially weak insurers. We measure the proximity of insurers and regulators as the distance between the insurer's headquarters and its state of domicile's state insurance regulator's location using their ZIP codes as measures of their location. Prior research suggests that the effect of geographic proximity is nonlinear. Soft information about companies travels most effectively when parties are located within a distance threshold. They claim that relatively little, if any, information transfer occurs beyond the threshold. Coval and Moskowitz (2001) report that information transfers are more likely to occur when agents are located within 100 kilometers of each other (see also Malloy, 2005; Uysal et al., 2008; Kedia and Rajgopal, 2011). Consistent with prior research, we use a dummy variable to distinguish whether companies are close to their monitor. We identify whether insurance companies' headquarters are within 100 kilometers of their monitors (state insurance regulator). Choi et al. (2012) use two dummy variables to measure distance. One measures whether companies and monitors are within 100 kilometers. The other measures whether companies are within the same metropolitan statistical area (MSA). Distances between companies and monitors within the same MSA tend to be less than 100 kilometers. We also use a second measure of distance in our setting. The second measure is based on whether insurers are less than 50 kilometers from their regulators. We refer to our two measures of distance as LOCAL_D50 and LOCAL_D100. We code LOCAL_D50 as one for insurers located less than 50 kilometers from their state's insurance regulator; otherwise, we code it as zero. Alternatively, we use code LOCAL_D100 as one if the insurer is located less than 100 kilometers from its regulator, and we code it as zero otherwise. In our sample,

10. For example, the 1993 reserve development for GE Mortgage Insurance Company (based on the 1998 developed reserve) is $116.512 million. Understated reserves result in understated losses and liabilities. Thus, we compute the ex ante losses and liabilities of GEMIC by adding $116.512 to the reported amounts. Understated reserves affect policyholder surplus on an after-tax basis. We use the federal tax rate of 35%, which was in place during our investigation period, and compute the ex ante policyholders' surplus by subtracting [$116.512 x (1 – 0.35)] from the reported surplus.

11. Using pre-managed results based on reported results purged of the insurer's five-year loss reserve error enables us to examine all of the IRIS ratios and avoid the selection bias described by Petroni (1992), which caused her to examine only a subset of IRIS ratios.

35% of our insurer firm-year observations are within 50 kilometers of their state insurance commission's office, and 49.6% are within 100 kilometers.

Consistent with prior research, we include several additional control variables in our model. The first two control for aspects of the composition of insurers' underwriting. The first control variable (LENGTH) measures claim loss reserves expressed as a percentage of total liabilities. This variable increases with the length of the insurer's claim cycle. The longer the cycle, the more difficult it is to forecast total claims. Prior research finds that insurers with long-tailed product lines, such as product liability and workers' compensation, tend to over-reserve, which is consistent with being more conservative when uncertainty is high (Petroni and Beasley, 1996; Gaver and Paterson, 2001, 2007). Because ERROR is negative when insurers over-reserve, LENGTH is expected to be negatively associated with ERROR. The second control variable (MEDMAL) measures the percent of net premiums written for malpractice insurance. Petroni (1992), Petroni and Beasley (1996), and Gaver and Paterson (2001, 2007) find that malpractice premiums tend to be negatively associated with reserve development.

Another factor to control for is income smoothing. Smoothing reported earnings reduces its volatility. Prior research suggests that insurers smooth their earnings by adjusting their loss reserves (Forbes, 1970; Balcarek, 1975; Smith, 1980; Weiss, 1985; Grace, 1990; Beaver et al., 2003). We measure it as net income in year t purged of the loss reserve error minus reported net income in year (t-1), divided by the absolute value of reported net income in year (t-1). We expect firms with high (low) pre-managed income to over-reserve (under-reserve). We include SMOOTH in our model, expecting it to have a negative estimated coefficient. We also include two variables to control two aspects of insurers' diversification. We also control for variation in product line diversification (HERF_LINES) and geographical diversification (HERF_GEOG) measured using Herfindahl Indices (Grace and Leverty 2010). Since low levels of diversification are associated with high Herfindahl indices, and low levels of diversification are associated with higher reserve estimates, we expect both of these two control variables to be negatively associated with insurer's loss reserve errors.[12] We also control for the strictness of rate regulations imposed by state insurance regulators (RATE_REG). Prior research is mixed regarding whether the strictness of rate regulations leads to more under-reserving (Nelson, 2000) or more over-reserving (Grace and Leverty, 2012). Other control variables include organizational form (MUTUAL), membership in a consolidated group (GROUP) and firm size (SIZE).

12. In sum, we select control variables based on prior research. The choice of control variables is a choice between simplicity and completeness. The choice is also influenced by sample size, including the control variable's effect on sample size. For example, some variables reduce the sample size more than others, such as the choice of auditor and actuary. Insurer earnings management studies that include these variables tend to have small samples (Petroni and Beasley, 1996; Gaver and Paterson, 2001).

Table 3:
Descriptive Statistics for Full Sample[a]

Variable[b]	Mean	Std. Dev.	Median	Lower quartile	Upper quartile
ERROR	-0.0167	0.0962	-0.0130	-0.0521	0.0077
WEAK	0.1763	0.3811	0.0000	0.0000	0.0000
LOCAL_D50	0.3505	0.4771	0.0000	0.0000	1.0000
LOCAL_D100	0.4960	0.5000	0.0000	0.0000	1.0000
DISTANCE	3.9238	1.8034	4.1573	2.6247	5.0626
LENGTH	0.4358	0.2426	0.4452	0.2398	0.6143
MAL	0.0577	0.2243	0.0000	0.0000	0.0000
NI_SMOOTH	0.0170	0.1112	0.0166	-0.0267	0.0618
HERF_EP	0.5184	0.2824	0.4712	0.2874	0.7211
HERF_GEO	0.6408	0.3804	0.7914	0.2294	1.0000
RATE_REG	0.0714	0.1384	0.0000	0.0000	0.0842
MUTUAL	0.2925	0.4549	0.0000	0.0000	1.0000
GROUP	0.61657	0.4863	1.0000	0.0000	1.0000
SIZE	17.7393	1.9703	17.6061	16.3674	19.0352

a. The full sample of 18,007 observations consists of insurers domiciled in the U.S., organized as stock companies or mutuals, and meeting certain data requirements for the years 1993–2013.
b. Variable definitions:
c. ERROR in year t is computed by subtracting the original loss reserve reported in year t from the five-year developed reserve reported in year (t+5). The difference is divided by admitted assets at the end of year (t-1).
d. WEAK is a qualitative variable that takes on the value of one if the insurer has four or more unusual IRIS ratios on a pre-managed basis. Pre-managed IRIS ratios are computed using annual statement data that has been purged of the loss reserve bias. Unusual ratios are those that exceed certain bounds specified by the National Association of Insurance Commissioners (NAIC). These bounds are described in Appendix A.
e. LOCAL_D50 is coded as one if the distance between the insurer's headquarters and its state of domicile's state insurance regulator is less than or equal to 50 kilometers, and it is coded as zero otherwise.
f. LOCAL_D100 is coded as one if the distance between the insurer's headquarters and its state of domicile's state insurance regulator is less than or equal to 100 kilometers, and it is coded as zero otherwise.
g. DISTANCE is the log of the distance between the insurer and the state insurance regulator for its state of domicile measured in kilometers.
h. LENGTH is the reported claim loss reserve as a percentage of total liabilities.
i. MAL is the percentage of malpractice premiums written relative to total premiums.
j. NI_SMOOTH is net income in year t purged of the loss reserve error minus reported net income in year (t-1), divided by the absolute value of reported net income in year (t-1).
k. HERF_EP is the Herfindal concentration index calculated across the lines of insurance. It is the sum of the squared percentages of business written in each of the approximately 30 lines of insurance.
l. HERF_GEO is the Herfindal concentration index calculated across the jurisdictions where the insurer underwrites insurance. It is the sum of the squared percentages of business written in each state and the District of Columbia.
m. RATE_REG is the percent of premiums the insurer writes in states with stringent rate regulation defined as state-made rates and prior approval rate regulation.
n. MUTUAL is coded as one if the company is organized as a mutual, and it is coded as zero if it is organized as a stock company.
o. GROUP is coded as one if the insurer belongs to a consolidated group of insurers, and it is coded as zero otherwise.
p. SIZE is the insurers admitted assets at the end of the prior year.
q. Continuous variables are winsorized at 1% and 99%. Continuous variables include ERROR, DISTANCE, LENGTH, MAL, NI_SMOOTH, HERF_EP, HERF_GEO, RATE_REG and SIZE.

To provide preliminary insights into the relation between insurers' loss reserve errors and their proximity to state insurance regulators, we perform a series of univariate analyses. Financially weak insurers are the ones with incentives to under-reserve. Focusing on these insurers leaves 3,174 firm-year observations for comparison between local and nonlocal insurers. We compare the mean of financially weak insurers' five-year loss reserve errors (ERROR) for companies located close to their regulator to those located far from their regulators. We repeat this comparison using each of our two measures of closeness (i.e., LOCAL_D50 and LOCAL_D100). Using a 50-kilometer threshold to distinguish whether insurers are close to their regulator, we find that the mean loss reserve error is 0.0923 for insurers that are close and 0.0722 for insurers that are far from their regulators. (See Table 4.) This result suggests that financially weak insurers close to their regulators under-reserve more than financially weak insurers far from their regulators. The difference in means and medians are statistically significant at 1% levels of significance. We find a qualitatively similar result using the second measure of distance based on 100 kilometers to define local versus nonlocal (LOCAL_D100). Using a 100-kilometer threshold, the loss reserve error means are 0.0914 and 0.0687 for local and nonlocal insurers, respectively. The difference in means and medians are statistically significant at the 1% level of significance. In sum, four univariate test results provide preliminary evidence that insurers' locations relative to their state insurance commissioner affect their earnings management with financially weak insurers under-reserving more if they are located close to their regulator. In order to control for factors other than insurers' financial weakness and their locations relative to their regulators, we perform multivariate analyses.

Table 4:
Loss Reserve Error for Financially Weak Insurers[a,b,c]

	Using Local_D50			Using Local_D100		
	Local (n=1,196)	Nonlocal (n=1,978)	p-value	Local (n=1,550)	Nonlocal (n=1,624)	p-value
Mean	0.0923	0.0722	0.0001	0.0914	0.0687	0.0001
Median	0.0595	0.0413	0.0017	0.0578	0.0409	0.0004
Std. dev.	0.1477	0.1271		0.1442	0.1259	

a. The full sample of 18,007 firm-year observations includes 3,174 firm-year observations where the insurer is considered to be financially weak measured as having four or more unusual Insurance Regulatory Information System (IRIS) ratio results based on annual report data purged of the company's five-year loss reserve error.

b. The loss reserve error is computed by subtracting the original loss reserve reported in year t from the five-year developed reserve reported in year (t+5). The difference is divided by admitted assets at the end of year (t-1).

c. Two alternative definitions are used to determine whether insurers are local to their state of domicile's insurance regulator. The first defines local as less than 50 kilometers. The second defines local as less than 100 kilometers.

Multivariate Evidence of Earnings Management

We perform repeated multivariate analyses of the relation between insurers' loss reserve errors and their locations relative to their regulators by estimating equation (1). We use insurers' scaled five-year loss revere errors as the dependent variable (ERROR). We include a measure of financial weakness (WEAK) and one of the two measures of insurers' closeness to their regulators (LOCAL_D50 or LOCAL_D100). We also include an interaction between financial strength and location (WEAK x LOCAL) to measure the incremental effect of being close to the regulator when the insurer is financially weak. Finally, we include the control variables described in section 4.2. We estimate our regressions using ordinary least squares, and we include fixed effects for firm, year and state of domicile.

$$\begin{aligned} ERROR_{i,t} = {} & \beta_i + \beta_t + \beta_s + \beta_1 WEAK_{i,t} + \beta_2 LOCAL_{i,t} + \beta_3 (WEAK_{i,t} \times LOCAL_{i,t}) + \beta_4 LENGTH_{i,t} \\ & + \beta_5 MAL_{i,t} + \beta_6 NI\_SMOOTH_{i,t} + \beta_7 HERF\_EP_{i,t} + \beta_8 HERF\_GEO_{i,t} \\ & + \beta_9 RATE\_REG_{i,t} + \beta_{10} MUTUAL_{i,t} + \beta_{11} GROUP_{i,t} + \beta_{12} SIZE_{i,t} + \varepsilon_{i,t} \quad (1) \end{aligned}$$

Solvency monitoring by insurance regulators focuses on constraining under-reserving, particularly among financially weak insurers. We expect a negative relation between our measure of financial condition (WEAK) and insurers' loss reserve errors (ERROR). Further, insurers located close to regulators are expected to be more likely to obtain and use soft information about insurers' financial conditions if the insurer is located close to the regulator. This gives financially weak insurers an increased risk of incurring costly regulatory scrutiny. Their incentive to avoid or delay detailed regulatory scrutiny may be higher than financially weak insurers located far from regulators. The interaction between WEAK and location (LOCAL_D50 and LOCAL_D100) will be positive if proximity incentivizes financially weak insurers to engage in more under-reserving if they are located close to regulators.

Consistent with expectations, we report in Table 5 that financially weak insurers tend to under-reserve. The estimated coefficient on WEAK is significantly positive regardless of using a 50-kilometer or 100-kilometer threshold to define local. Unique to our study, we provide evidence that financially weak insurers located near their state insurance regulators engage in more under-reserving than their financially weak counterparts located far from regulators. We determine this outcome based on finding a positive estimated coefficient on WEAKxLOCAL for both specifications of location. Using a 50-kilometer threshold for closeness (i.e., WEAK x LOCAL_D50), we find a significantly positive estimated coefficient of 0.0089 (p-value=0.011). When we use a 100-kilometer threshold (i.e., WEAKxLOCAL_D100), we find a significantly positive estimated coefficient of 0.0090 (p-value=0.008). While the positive coefficient on WEAK suggest financially weak insurers under-reserve, the positive coefficient on WEAKxLOCAL indicates that financially weak insurers located close to their regulators under-reserve even more than nonlocal ones located far from their regulators. In contrast, the stand-alone location variable (LOCAL) is not significant

using a 50-kilometer threshold (-0.0003; p-value=0.949) or using a 100 kilometer threshold (0.0060; p-value=0.106). The results for LOCAL suggest the location among financially healthy insurers has little, if any, effect on their reserve misestimations. The adjusted R-square is 0.748 for both regressions, suggesting the overall explanatory power of our model is relatively high. The majority of the model's control variables are also statistically significant with their expected signs.

Table 5:
Estimated Coefficients and p-values From a Regression of Loss Reserve Error on Insurer Financial Condition, Distance to the Regulator and Control Variables[a]

		Using LOCAL_D50	Using LOCAL_D100
Variable[b]	Expected Sign[c]	Coefficient (p-value)	Coefficient (p-value)
Intercept		0.0281	0.0293
		(0.502)	(0.485)
WEAK	+	0.0465***	0.0455***
		(0.001)	(0.001)
LOCAL		-0.0003	0.0060
		(0.949)	(0.106)
WEAK×LOCAL		0.0089**	0.0090***
		(0.011)	(0.008)
LENGTH	-	-0.0474***	-0.0474***
		(0.001)	(0.001)
MAL	-	-0.0116	-0.112
		(0.484)	(0.496)
NI_SMOOTH	-	-0.5015***	-0.5012***
		(0.001)	(0.001)
HERF_EP	-	-0.0132***	-0.0133***
		(0.001)	(0.001)
HERF_GEO	-	-0.0099***	-0.0102***
		(0.010)	(0.008)
RATE_REG		-0.0027	-0.0028
		(0.652)	(0.639)
MUTUAL		0.0065*	0.0066*
		(0.074)	(0.070)
GROUP		0.0007	0.0005
		(0.795)	(0.845)
SIZE	-	0.0004	0.0003
		(0.815)	(0.819)
Fixed effects for year		Yes	Yes
Fixed effects for firm		Yes	Yes
Fixed effects for state of domicile		Yes	Yes
Sample size		18,007	18,007
Adjusted R^2		0.748	0.748

a. The full sample of 18,007 observations consists of insurers domiciled in the U.S., organized as stock companies or mutuals, and meeting certain data requirements for the years 1993–2013.
b. Variable definitions: refer to Table 3.
c. One-tailed p-values are reported for WEAK, LENGTH, MAL, NI_SMOOTH, HERF_EP, HERF_GEO and SIZE. Two-tailed p-values are reported for LOCAL, WEAK×LOCAL, RATE_REG, MUTUAL, GROUP and the intercept.

In many cases, a continuous measure is considered to be a more powerful measure than a dummy variable based on the same data. In settings examining the potential effects of soft information, the distances literature suggests the opposite: Parties are either close or they are not, and a dummy variable more appropriately captures the potential effects of soft information. Prior research suggests that soft information more easily passes or is more likely to be passed when two parties are located near one another (Ayers et al., 2007; Bae et al., 2008; Baik et al., 2010). Being close or local makes it easier to arrange meetings, makes it less expensive to have meetings, or even makes it more likely that the two parties meet by chance either one another or meet shared contacts located in the same community. Using a continuous measure, however, is consistent with DeFond et al. (2018), and we perform an analysis of proximity using a continuous measure of distance between insurers and their regulators.

In Table 6, we report the results of estimating equation (1) replacing LOCAL with DISTANCE, which is a logarithmic continuous measure of distance between the insurer. Transforming with logs reduces the effects of outliers. In this test, we expect a negative relation between WEAKxDISTANCE because larger distances indicate insurers are farther from their regulator—rather than near or local to them. Given the potential nonlinear relation between our distance measure insurers' loss reserve errors, we include variables with distance squared as additional variables in a second regression. Regardless of whether squared terms are included, our results indicate that financially weak insurers tend to under-reserve (0.0556and 0.0485; p-values are significant at the 1% level). We also report that the estimated coefficient on WEAKxDISTANCE is negative, but it is not statistically significant in regressions with and without squared distance terms (-0.0014; p-value=0.125; -0.034; p-value=0.283, respectively). The interaction between WEAK and DISTANCE square is not statistically significant (-0.0006; p-value=0.139). These results are consistent with the notion that binary variables are more powerful measures than continuous ones when investigating issues associated with soft information being available. Similar to the results reported in Table 5, the majority of the control variables are statistically significant in their predicted directions in Table 6, and the overall explanatory power of the models is high.

Company size can matter. For example, large firms are more likely to be audited by the Internal Revenue Service (IRS) (Hoopes, Mescall, and Pittman 2012; Kubick, Lockhart, Mills, and Robinson 2017). The size of an insurance company may affect the oversight conducted by state insurance regulators. On one hand, large insurers tend to be more diversified, financially healthy and over-reserved. On the other hand, their large size also makes them more visible to monitors, and a large insurer's insolvency imposes a higher cost on society. Insurer size might affect the regulators' prioritization for additional regulatory scrutiny. If, for example, regulators are more likely to prioritize large insurers for detailed investigations, including on-site examinations even at the slightest sign of red flags, large insurers (including financially weak ones) potentially have less to gain from under-reserving. We re-estimate equation (1) after partitioning the full sample into four subsamples based on insurers' relative size based on their admitted assets. In panel A of Table 7, we

report the four sets of regression results, including one for each insurer-size quartile while using LOCAL_D50 as the measure of insurer location. In panel B of Table 7, we report similar results based on LOCAL_D100.

Table 6:
Estimated Coefficients and p-values From a Regression of Loss Reserve Error on Insurer Financial Condition, Distance to the Regulator and Control Variables[a]

Variable[b]	Expected Sign[c]	Coefficient (p-value)	Coefficient (p-value)
Intercept		0.0335	0.0306
		(0.432)	(0.475)
WEAK	+	0.0556***	0.0485***
		(0.001)	(0.001)
DISTANCE		-0.0008	0.0024
		(0.380)	(0.399)
WEAK×DISTANCE		-0.0014	-0.0034
		(0.125)	(0.284)
$DISTANCE^2$			-0.0004
			(0.261)
$WEAK \times DISTANCE^2$			-0.0006
			(0.138)
LENGTH	-	-0.0472***	-0.0474***
		(0.001)	(0.001)
MAL	-	-0.0117	-0.111
		(0.241)	(0.251)
NI_SMOOTH	-	-0.5016***	-0.5014***
		(0.001)	(0.001)
HERF_EP	-	-0.0131***	-0.0131***
		(0.001)	(0.001)
HERF_GEO	-	-0.0102***	-0.0104***
		(0.005)	(0.004)
RATE_REG		-0.0030	-0.0028
		(0.625)	(0.648)
MUTUAL		-0.0064*	-0.0066*
		(0.077)	(0.071)
GROUP		0.0007	0.0007
		(0.771)	(0.790)
SIZE	-	0.0003	0.0003
		(0.815)	(0.814)
Fixed effects for year		Yes	Yes
Fixed effects for firm		Yes	Yes
Fixed effects for state of domicile		Yes	Yes
Sample size		18,007	18,007
Adjusted R^2		0.748	0.748

a. The full sample of 18,007 observations consists of insurers domiciled in the U.S., organized as stock companies or mutuals, and meeting certain data requirements for the years 1993–2013.
b. Variable definitions: refer to Table 3.
c. One-tailed p-values are reported for WEAK, LENGTH, MAL, NI_SMOOTH, HERF_EP, HERF_EP and SIZE. Two-tailed p-values are reported for DISTANCE, WEAKxDISTANCE, RATE_REG, MUTUAL, GROUP and the intercept.

In panel A using a 50-kilometer threshold for closeness, we report four sets of results that are relatively similar to the ones reported in Table 5 using a 50-kilometer threshold with the loss of some statistical significance among control variables and one noteworthy exception among variables of interest. The estimated coefficient on the interaction of WEAK and LOCAL is statistically significant when using the smallest two quartiles of insurers (0.0147; p-value=0.048; 0.0086; p-value=0.060, respectively). The corresponding estimated coefficient for WEAKxLOCAL is not significantly positive for the larger two quartiles (-0.0013; p-value=0.581; 0.0060; p-value=0.202, respectively). Based on these results, we determine that increased under-reserving among financially weak insurers located close to regulators is largely absent among the largest insurers but is present among the smallest insurers. We ascribe this result to the notion that the largest insurers are more visible even to regulators. They may be the most well-known and scrutinized by regulators regardless of their IRIS results, suggesting they are less likely to avoid or delay detailed scrutiny by managing their reserves. These circumstances may contribute to why the largest insurers are less inclined to use under-reserving to circumvent regulators' ratio monitoring.

The results for the 100-kilometer threshold for closeness reported in panel B of Table 7 provide similar evidence of a location effect among financially weak insurers and differences based on insurer size. Again, the estimated coefficients on WEAKxLOCAL are significantly positive for the smaller two quartiles (0.0165; p-value=0.044; 0.0143; p-value=0.042, respectively), but not for the larger two quartiles (0.0025; p-value=0.700; 0.0036; p-value=0.562, respectively). Thus, the results suggest that size may affect insurers' attempts to circumvent regulators' initial solvency screen.

Conclusion

Prior research indicates that proximity between a company and its monitor tends to improve the monitor's performance. The improvement is attributed to the availability and use of soft information about companies located close to monitors. Direct evidence about the effect of soft information is difficult to obtain. We examine a setting where soft information is more likely to be used after an initial step of investigation occurs, and likelihood of involvement in further scrutiny is determined largely by the initial step's outcome. In the case of state insurance regulators, the initial step involves calculating financial ratios computed using companies' financial reports. Such a regulatory environment potentially incentivizes companies to engage in more earnings management when they are located close to regulators. This higher than normal incentive occurs because companies engaging in earnings management can potentially alter their reported ratio results and affect whether they are prioritized for more detailed scrutiny where soft information may be more of a factor. Financially weak companies located close to the regulator have an especially high incentive to report favorable ratio results in

order to prevent regulators from considering additional information, including soft information, about the company's financial condition. Our results are in sharp contrast to the body of prior research investigating the effects of proximity on monitoring effectiveness. It also reflects the features of the particular industry we use to investigate these issues.

Table 7:
Estimated Coefficients and p-values From a Regression of Loss Reserve Error on Insurer Financial Condition, Distance to the Regulator and Control Variables for Subsamples Based on Firm Size[a]

Panel A: Insurers located within 50 kilometers of their state insurance regulator are considered local

Variable[b]	Expected Sign	First Quartile Coefficient (p-value)	Second Quartile Coefficient (p-value)	Third Quartile Coefficient (p-value)	Fourth Quartile Coefficient (p-value)
Intercept		-0.1263	0.1406*	0.1254	0.0392
		(0.108)	(0.085)	(0.113)	(0.624)
WEAK	+	0.0412***	0.0486***	0.0405***	0.0428***
		(0.001)	(0.001)	(0.001)	(0.001)
LOCAL		-0.0145	-0.0099	0.0011	0.0201
		(0.175)	(0.210)	(0.888)	(0.182)
WEAK×LOCAL		0.0147**	0.0086*	-0.0013	0.0066
		(0.048)	(0.060)	(0.581)	(0.202)
LENGTH	-	-0.0566***	-0.0671***	-0.0568***	-0.0369***
		(0.001)	(0.001)	(0.001)	(0.005)
MAL	-	-0.0151	0.0887	-0.0470***	-0.0308***
		(0.711)	(0.950)	(0.166)	(0.225)
NI_SMOOTH	-	-0.4097***	-0.5034***	-0.5040***	-0.5647***
		(0.001)	(0.001)	(0.001)	(0.001)
HERF_EP	-	-0.0125	-0.0120*	-0.0125*	-0.0296***
		(0.110)	(0.055)	(0.086)	(0.003)
HERF_GEO	-	0.0130	-0.0161**	-0.0351**	0.0042
		(0.834)	(0.020)	(0.001)	(0.636)
RATE_REG		-0.0052	0.0027	-0.0159	0.0078
		(0.677)	(0.852)	(0.325)	(0.478)
MUTUAL		-0.0070	0.0121	0.0166**	0.0058
		(0.379)	(0.137)	(0.024)	(0.641)
GROUP		0.0017	0.0012	-0.0072	-0.0045
		(0.826)	(0.772)	(0.156)	(0.442)
SIZE	-	0.0071	0.0039	-0.0062*	0.0027
		(0.897)	(0.375)	(0.092)	(0.535)
Clustering by year		Yes	Yes	Yes	Yes
Clustering by firm		Yes	Yes	Yes	Yes
Clustering by state of domicile		Yes	Yes	Yes	Yes
Sample size		4,501	4,503	4,500	4,503
Adjusted R^2		0.695	0.761	0.782	0.825

Table 7 (continued):

Panel B: Insurers located within 100 kilometers of their state insurance regulator are considered local

Variable[b]	Expected Sign	First Quartile Coefficient (p-value)	Second Quartile Coefficient (p-value)	Third Quartile Coefficient (p-value)	Fourth Quartile Coefficient (p-value)
Intercept		-0.1286	0.1567*	0.1258	0.0414
		(0.101)	(0.055)	(0.110)	(0.607)
WEAK	+	0.0376***	0.0453***	0.0389***	0.0439***
		(0.001)	(0.001)	(0.001)	(0.001)
LOCAL		0.0025	0.0047	0.0004	0.0213
		(0.847)	(0.530)	(0.961)	(0.074)
WEAK×LOCAL		0.0165**	0.0143**	0.0025	0.0036
		(0.044)	(0.041)	(0.700)	(0.562)
LENGTH	-	-0.0565***	-0.0672***	-0.0571***	-0.0365***
		(0.001)	(0.001)	(0.001)	(0.003)
MAL	-	-0.0162	0.0891	-0.0464*	-0.0299
		(0.345)	(0.949)	(0.086)	(0.119)
NI_SMOOTH	-	-0.4092***	-0.5033***	-0.5037***	-0.5650***
		(0.001)	(0.001)	(0.001)	(0.001)
HERF_EP	-	-0.0132*	-0.0126**	-0.0124*	-0.0300***
		(0.099)	(0.046)	(0.086)	(0.003)
HERF_GEO	-	0.0130	-0.0159**	-0.0351***	0.0051
		(0.832)	(0.021)	(0.001)	(0.573)
RATE_REG		-0.0057	0.0034	-0.0158	0.0086
		(0.650)	(0.812)	(0.326)	(0.432)
MUTUAL		-0.0064	0.0122	0.0166**	0.0053
		(0.427)	(0.122)	(0.024)	(0.671)
GROUP		0.0013	0.0005	-0.0072	-0.0042
		(0.866)	(0.908)	(0.159)	(0.469)
SIZE	-	0.0073	0.0037	-0.0062*	0.0023
		(0.897)	(0.394)	(0.093)	(0.594)
Clustering by year		Yes	Yes	Yes	Yes
Clustering by firm		Yes	Yes	Yes	Yes
Clustering by state of domicile		Yes	Yes	Yes	Yes
Sample size		4,501	4,503	4,500	4,503
Adjusted R^2		0.695	0.762	0.782	0.825

a. Each subsample includes insurers domiciled in the U.S., organized as stock companies or mutuals, and meeting certain data requirements for the years 1993–2013 divided into quartiles by firm size using admitted assets.

b. Variable definitions: refer to Table 3.

We examine P/C insurers. Since the 1970s, state insurance commissions have relied upon IRIS ratios as an early warning system. In this system, state regulators use financial ratios to help them prioritize insurers for further examination. The resulting examination may include site visits, including discussions with company personnel and others who may provide soft information not available in the insurer's statutory annual reports. Prior research into the effects of distances between parties suggests that soft information tends to be more readily available when parties are close, and soft information tends to make close stakeholders better monitors. The

use of soft information is likely to be both available and used by state insurance regulators when they are focusing on insurers that are located close.

Our study finds that financially weak insurers located close to state insurance regulators under-reserve losses more than those located far from their regulators. Close proximity alone does not increase the likelihood of under-reserving, such as among financially healthy insurers. Rather, the effect of proximity is strongest among those insurers expected to have the greatest incentives to under-reserve. We further determine that the size of the insurer influences the relation between proximity and under-reserving. The largest insurers are less likely to under-reserve when they are financially weak. This result is consistent with larger firms being the object of additional scrutiny regardless of their reported IRIS ratios.

We conclude that the multistep regulatory processes used in the insurance industry may have an unintended consequence. We believe it occurs as a result of the process starting with a set of measures used to prioritize companies for further additional scrutiny. An unintended consequence of the sequential nature of such a regulatory process is to give managers incentive to manage earnings to avoid failing the first step or phase of regulators' tests. We suggest that our findings provide insight into the debate about the advantages and disadvantages of rules-based versus principles-based regulatory systems. While insurer regulation is unique, regulators in other settings struggle with the choice of system to use. Our study provides a reason to be cautious at least in terms of using a rules-based system that involves using well-known, fixed measures to screen companies for further scrutiny. Other settings may be using similar screening processes with similar outcomes. Future research should focus on identifying other settings where similar unintended consequences occur. Future research should also consider whether changes that have occurred (e.g., federal Sarbanes-Oxley Act) and circumstances that exist (e.g., auditor choice) mitigate the negative effects of the unintended consequences we describe.

Appendix A: IRIS Description, Ratio Definitions, Bounds and Relation to Loss Reserve

Information about the Insurance Regulatory Information System (IRIS) ratios, including their formulas and bounds, are obtained from the 1994–2014 editions of *Insurance Regulatory Information System (IRIS) Ratios Manual*. The ratio's definitions and bounds remained the same during 1993–2004 period. In 2005, the National Association of Insurance Commissioners (NAIC) changed the upper and lower bounds for the investment yield ratio to 6.50 and 3.0. Also in 2005, the NAIC added the adjusted surplus ratio. In 2009, the NAIC changed the adjusted liabilities to liquid assets ratio bound to 100.

The following reflect the NAIC's ratio calculation worksheets (NAIC 2014):

Ratio 1: Gross premiums written to policyholders' surplus. Acceptable bound: not over 900.
Gross premiums: The sum of gross premiums written from direct business, reinsurance from affiliates and reinsurance from nonaffiliates. *Surplus*: Policyholders' surplus, which is analogous to the stockholders' equity accounts (retained earnings, common stock, preferred stock and additional paid-in capital) of a company following generally accepted accounting principles (GAAP).
Discussion: Lower levels of loss reserves decrease (improve) this ratio by increasing the surplus.

Ratio 2: Net premiums written to policyholders' surplus. Acceptable bound: not over 300.
Net premiums: Gross premiums reduced by reinsurance ceded to affiliates and reinsurance ceded to non-affiliates. *Discussion:* Lower levels of loss reserves decrease (improve) this ratio by increasing the surplus.

Ratio 3: Change in net premiums written. Acceptable bound: not over 33 and not less than
-33. *Change in net premiums written*: The increase or decrease in net premiums written, divided by net premiums written in the prior year. *Discussion:* Loss reserves do not affect this ratio.

Ratio 4: Surplus aid to policyholders' surplus. Acceptable bound: not over 15.
Surplus aid: The ratio of commissions on ceded reinsurance to premiums for ceded reinsurance multiplied by the unearned premiums on reinsurance ceded to nonaffiliates.
[(Commissions on ceded reinsurance/Premiums for ceded reinsurance) x Unearned premiums on reinsurance ceded to nonaffiliates] *Discussion:* Lower levels of loss reserves decrease (improve) this ratio by increasing the surplus.

Ratio 5: Two-year operating ratio. Acceptable bound: not over 100.
The two-year operating ratio is the loss ratio, plus the expense ratio, minus the net investment ratio, all measured during a two-year period. *Loss ratio:* The numerator is the sum of losses, loss expenses incurred and policyholder dividends from the current and prior period. The denominator is premiums earned in the current and prior period. *Expense ratio:* The numerator is other underwriting expenses and deductions from the current and prior period. The denominator is premiums written in the current and prior period. *Net investment ratio:* The numerator is net investment income from the current and prior period. The denominator is premiums earned in the current and prior period. *Discussion:* The expense ratio and the net investment ratio are not affected by the level of loss reserves. However, estimating lower loss reserves decreases current period losses, which decreases the loss ratio and, therefore, also decreases (improves) the two-year overall operating ratio.

Ratio 6: Investment yield. Acceptable bound: above 3%, but not over 6.5%.
Investment yield: Two times net investment income divided by the average amount of cash and invested assets during the year. Net investment income is the sum of interest, dividends and real estate income (excludes capital gains on sales of investments). *Discussion:* Loss reserves do not affect this ratio.

Ratio 7: Gross change in policyholders' surplus. Acceptable bound: not over 50% and not less than -10%.
Change in surplus: The increase or decrease in policyholders' surplus as a percentage of policyholders' surplus at the end of the prior year, where policyholders' surplus is defined as in ratio 1. *Discussion:* Lower levels of loss reserves increase this ratio by increasing the surplus.

Ratio 8: Change in adjusted policyholders' surplus. Acceptable bound: not over 25% and not less than -10%.
Change in surplus: The increase or decrease in policyholders' surplus net of change in surplus notes, capital paid-in or transferred, and surplus paid-in or transferred as a percentage of policyholders' surplus at the end of the prior year. *Discussion:* Lower levels of loss reserves increase this ratio by increasing the surplus.

Ratio 9: Adjusted liabilities to liquid assets. Acceptable bound: not over 100.
Liabilities: Obligations including estimated losses, such as incurred but not reported reserves.
Liquid assets: Cash and other investments (such as bonds), reported at their annual statement (book) value. *Discussion:* Under-reserving decreases (improves) the ratio by reducing the numerator.

Ratio 10: Gross agents' balances to policyholders' surplus. Acceptable bound: not over 40.
Agents' balances: Agents' balances in the course of collection. *Discussion:* Lower levels of loss reserves decrease (improve) this ratio by increasing the surplus.

Ratio 11: One-year reserve development to policyholders' surplus. Acceptable bound: not over 20.
One-year reserve development: The estimated incurred loss for all years except the current year minus the incurred loss for all years as reported at the end of the prior year. $Surplus_{t-1}$*:* Surplus, as defined in ratio 1, at the end of the prior year. *Discussion:* In general, lower loss reserve estimates reduce (improve) this ratio.

Ratio 12: Two-year reserve development to policyholders' surplus.. Acceptable bound: not over 20.
Two-year reserve development: The estimated incurred loss for all years except the current and prior year, minus the incurred loss for all years as reported at the end of the year before the prior year.

$Surplus_{t-2}$: Surplus, as defined in ratio 1, at the end of the year before the prior year. *Discussion:* In general, lower loss reserve estimates reduce (improve) this ratio.

Ratio 13: Estimated current reserve deficiency to policyholders' surplus. Acceptable bound: not over 25.
Estimated reserves: A forecast of the appropriate level of loss reserves, computed as the current net premium earned multiplied by the average ratio of developed reserves to earned premiums for the last two years. *Current estimated reserve deficiency:* The difference between the estimated reserves for the company and the actual reserves reported by the company. *Discussion:* Under-reserving increases the surplus (the denominator), which improves the ratio. However, under-reserving also increases the deficiency (the numerator), which worsens the ratio. In general, the numerator effect is stronger than the denominator effect, which means that under-reserving worsens the ratio.

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Abstracts of Significant Cases Bearing on the Regulation of Insurance 2019

Olivea Myers*

United States Court of Appeals

Fifth Circuit

Texas v. United States, 945 F.3d 355 (5th Cir. 2019)

A group of states led by Texas ("Plaintiffs") sued the federal government challenging the constitutionality of the Patient Protection and Affordable Care Act ("ACA") in the United States District Court for the Northern District of Texas. Plaintiffs argued that the individual mandate requiring all citizens to have health insurance is unconstitutional and that it is not severable from the entire Act; therefore, the entire law should be invalidated. The district court agreed with Plaintiffs and held that the individual mandate was unconstitutional, inseverable, and therefore, struck down the ACA in its entirety. California and other intervening states appealed the district court's decision to the United States Court of Appeals for the Fifth Circuit. The United States House of Representatives motioned the Fifth Circuit to intervene as a defendant, and the Fifth Circuit granted the motion. The issues raised in this case were: 1) did Plaintiffs' have standing to challenge the individual mandate; 2) did the House of Representatives have standing to intervene; 3) is the individual mandate constitutional; and 4) even if the court finds that the individual mandate is unconstitutional, is it severable and should the remaining provisions of the ACA should remain in effect.

The Fifth Circuit held that both the House of Representatives and Plaintiffs have standing, as there is a live case and controversy, and that the individual mandate is unconstitutional. The Fifth Circuit remanded the case to the district court to "explain with more precision what provisions of the post-2017 ACA are indeed

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inseverable from the individual mandate." In January 2020, the General Counsel of the House of Representatives filed a petition for a writ of certiorari in the United States Supreme Court and a motion to expedite consideration of the certiorari petition. The Supreme Court ordered the Plaintiffs to file a response to this motion. On January 21, 2020, the Supreme Court denied the motion to expedite consideration of the certiorari petition.

United States District Courts

District of Columbia

New York v. United States Dep't of Labor, 363 F.Supp.3d 109, (D.D.C. 2019)

In this case, eleven states and the District of Columbia ("States") sued the United States Department of Labor ("DOL") alleging that the DOL's Final Rule interpreting the definition of "employer" under the Employee Retirement Income Security Act of 1974 ("ERISA"), is unlawful under the Administrative Procedure Act ("APA"). The States further argued that the DOL's Final Rule violates the Patient Protection and Affordable Care Act ("ACA") that "establishes standards that apply differently to individual, small-group, and large-group health insurance markets" by intentionally trying to bypass the ACA's distinct standards.

In June 2018, the DOL promulgated the Final Rule, that relaxed two of the three key criteria for qualifying as a "bona fide association" to establish an association health plan ("AHP") under ERISA. The three criteria are purpose, commonality of interest, and control. The Final Rule relaxed the commonality of interest and purpose requirements. AHPs can now satisfy the new "commonality of interest" test if their members are either in the same trade or business or in the same geographic area. Before the Final Rule, "geography, alone, was not sufficient to establish commonality." AHPs can now be recognized as "bona fide associations" even if its primary purpose is "to offer and provide health coverage to its employer members and their employees" as long as it has "at least one substantial business purpose" unrelated to the provision of health care. Prior DOL guidance "required that associations be viable organizations even without providing an AHP." The Final Rule adds an entirely new provision that allows working owners, or sole proprietors, without any employees, to "qualify as both an employer and employee" for two ERISA purposes. First, working owners may join bona fide associations of employers. Second, working owners may qualify as both employer and employee for the "purposes of satisfying the requirement that AHPs—as ERISA health benefit plans—may only offer health coverage 'to employer members through the association'" for qualifying employees and beneficiaries. Prior DOL guidance held that "working owners without common law employees were not permitted to participate" in an AHP.

The district court held in favor of the States, holding that the Final Rule is unlawful because the bona fide association and working owner provisions conflict with the text and purpose of both the ACA and ERISA. The DOL appealed this decision believing that they should be given deference in their decision to expand the term "employer" under ERISA in the United States Court of Appeals for the District of Columbia Circuit, but a decision has not been reached.

Maine

Nat'l Fire Adjustment Co., Inc. v. Cioppa, 357 F.Supp.3d 38 (D. Me. 2019)

In this case, the National Fire Adjustment Company, Inc. ("NFA") challenged the Maine Bureau of Insurance's ("Bureau") enforcement of 24-A M.R.S. § 1476, that prohibits public adjusters from soliciting business from or offering a contract for public adjustment services to Maine citizens within the first 36 hours after property damage has occurred. NFA argued that the enforcement of this provision violates its First Amendment right to free speech. The Bureau argued that enforcing the 36-hour rule advances "a substantial governmental interest and is no more burdensome than is necessary to serve that interest."

The district court upheld the 36-hour rule as it relates to offering a contract for public adjustment but struck the anti-solicitation ban. The court held that as it relates to the 36-hour rule "prohibit[ing] the actual offer of a public adjustment contract" before 36 hours "serves a substantial consumer protection interest." However, the court held that the 36-hour rule's ban on all solicitation is unconstitutionally broad.

Florida

Phillips v. NCL Corp., No. 18-23912-Civ-Scola, 2019 WL2288987 (S.D. Fla. May 29, 2019)

Cruise ship passengers ("Plaintiffs") filed a lawsuit against Norwegian Cruise Lines ("NCL") alleging violations of the Florida Deceptive Unfair Trade Practices Act ("FDUTPA") and unjust enrichment. Plaintiffs' claims arise out of their purchase of the Booksafe Travel Protection Program ("BTPP"). The BTPP includes a travel insurance policy, as well as access to both a cancellation fee waiver program and an emergency assistance program. Plaintiffs purchased their cruise ticket, and they agreed to the terms and conditions of the Guest Ticket Contract. The Guest Ticket Contract has a broad arbitration clause that requires that any claims that are related to the guest's cruise shall be resolved by binding arbitration. The Guest Ticket Contract also includes a class action waver. Plaintiffs allege that NCL violated FDUTPA and was unjustly enriched by receiving unearned and undisclosed commissions related to the their purchase of the BTPP, bundling the BTPP together

to conceal the true cost of the program, and presenting the BTPP to create an impression that the price for the BTPP was comprised of pass-through charges even though NCL received an unearned and undisclosed commission. The sole issue before the district court was whether Plaintiffs' claims related to the purchase of the BTPP, fall within the scope of the arbitration clause.

The district court held that the Plaintiffs' claims fall under the scope of the arbitration clause in the Guest Ticket Contract. "The whole purpose of [BTPP] is to protect Plaintiffs' stay on the cruise, which is the core of the Contract. . . Indeed, without the stay on the cruise, which is the core of the Contract there is no [BTPP] and therefore no claims for the Plaintiffs to advance." The district court applied the same analysis to the class action waver, holding that the waiver applies to the Plaintiffs' claims and should be enforced. The district court granted NCL's motion to compel arbitration and dismissed the case.

State Courts

California

Mercury Cas. Co. v. Lara, 35 Cal. App. 5th 82 (Cal. Ct. App. 2019)

In its 2014 edition, the *Journal of Insurance Regulation* reported on *Mercury Cas. Co. v. Jones*, Case No. 34-2013-80001426 (Cal. Super. Ct. June 11, 2014), where the Petitioner, Mercury Casualty Company ("Mercury") challenged the insurance commissioner's order that its proposed homeowners insurance rates were excessive. Mercury challenged the application of Proposition 103, which was enacted by California voters in 1988 and required insurers to roll back insurance rates 20%. Insurers are able to request a variance from this percentage if the resulting rate would be "confiscatory." Insurers would have to prove to the commissioner that the decrease in insurance rates would cause the insurer to suffer deep financial hardship to its enterprise as a whole. Mercury claimed the commissioner prohibited the use of Mercury's own data to demonstrate the financial hardship.

The Court found that Mercury's request to substitute its own expense data into the ratemaking formula would effectively relitigate a matter that was already decided by the administrative law judge. The Court also affirmed the commissioner's removal of institutional advertising expenses from the ratemaking formula, as such expenses are expressly excluded under state regulations.

In 2015, the Commissioner fined Mercury 27.6 million dollars for charging consumers unapproved and unfairly discriminatory rates. In the present case, Mercury appealed the Commissioner's fine and the California Court of Appeals affirmed the Commissioner's decision. On August 14, 2019, the California Supreme Court denied Mercury's petition for review, thereby upholding the Commissioner's order fining Mercury.

Illinois

Corbin v. Allstate Ins. Co., No. 5-17-0296, 2019 WL 362480 (Ill. App. Ct. 5th Jan. 29, 2019)

Plaintiffs filed a class action lawsuit against Allstate. Plaintiffs alleged three claims: 1) Allstate violated the Consumer Fraud Act by engaging in unfair and deceptive practices in developing their rating methodologies; 2) Allstate's alleged failure to disclose its use of price optimization (charging longtime policyholders higher premiums rather than new customers who bear the same amount of risk, but were unwilling to pay the higher price) also violated the Consumer Fraud Act; and 3) Allstate has unjustly enriched itself by employing hidden price optimization practices. Allstate argues that Plaintiffs' claims are barred by the filed rate doctrine that provides protection to public utilities and other public entities from civil suits "if the entity is required to file its rates with the governing regulatory agency and the agency has the authority to set, approve, or disapprove the rates."

The appellate court was charged with answering two certified questions from the circuit court. The first question asks whether the Plaintiffs' claims regarding Allstate's rate filings are barred by the filed rate doctrine. The second question asks whether the Department of Insurance ("Department") has primary jurisdiction—a doctrine that allows an administrative agency to decide an issue even though the circuit court has jurisdiction over the issue—"to determine if the complained-of conduct by a regulated automobile insurance company constitutes an unfair or deceptive trade practice."

The appellate court held that the filed rate doctrine did not apply because the Department's Director does not have any administrative authority to set, approve, or disapprove of filed rates. The court held that rates filed by Allstate are not subject to approval by the Department, therefore the filed rate doctrine does not apply in this case. The appellate court also held that the Department did not have primary jurisdiction over Plaintiff's claims holding that the violations alleged in Plaintiffs' claims are not prohibited in the unfair methods of competition section in the insurance code; therefore, the Department does not have any "specialized knowledge or technical expertise with regard to the deceptive practices alleged." Having answered the questions before the court, the appellate court remanded the case to the circuit court for adjudication of Plaintiffs' claims.

Missouri

Holden v. Dep't of Commerce and Ins., No. WD82506, 2019 WL 6703849 (Mo. Ct. App. Dec. 10, 2019)

In this case, Petitioner Michael Holden submitted a non-resident title insurance producer's license application in 2009 with the Missouri Department of Commerce

and Insurance ("Department"). The Director of the Department issued an order refusing Holden a license. The Department found that Holden's application failed to disclose that he used to be President of Guaranty Land Title Insurance, Inc. ("Guaranty"). Holden's application also failed to disclose three voluntary forfeiture agreements Guaranty entered into when Holden was President of the Company. The Department also held that Holden violated state law by transacting business as an insurance producer without a license in 2008 and 2009. Holden appealed the Department's order to the Administrative Hearing Commission ("AHC"). The AHC upheld the Department's order. Holden then appealed the AHC's decision in the Cole County Circuit Court. While Holden's appeal was pending, he filed another application for the same non-resident title insurance producer license in October 2014. In that application, he disclosed the information he omitted in his previous 2009 application. The Department again refused to issue Holden a non-resident title insurance producer's license relying on the same grounds used in the 2009 application. Holden sought relief from the AHC again, and the Department's order was again upheld as the AHC found that the Department had cause to deny Holden's application and that his arguments were barred by collateral estoppel because the same issues were raised in his 2009 appeal. Holden filed another petition in the Cole County Circuit Court where the circuit court agreed with Holden. The Circuit Court found that the Department violated Holden's constitutional rights to due process for denying his 2014 application based on the same reasons as the 2009 application. The Department appealed to the Missouri Court of Appeals. The Department argued that the Circuit Court's decision should be reversed because the Circuit Court lacked statutory authority to review the administrative decision as a contested case.

The Missouri Court of Appeals held that, "for purposes of judicial review, the Missouri Administrative Procedure Act classifies administrative proceedings as either 'contested' or 'non-contested cases.'" "Contested cases provide the parties with an opportunity for a formal hearing with the presentation of evidence, including sworn testimony of witnesses and cross-examination of witnesses, and require written findings of fact and conclusions of law." "Non-contested cases do not require formal proceedings or hearing before the administrative body." In a non-contested case, the circuit court hears evidence, determines facts, and determines the validity of the agency's decision. The court of appeals held that based on a Missouri Supreme Court ruling, the Department's decisions are non-contested cases. The court of appeals reversed and remanded the circuit court's ruling and ordered that the circuit court lacked the statutory authority to review this case as a contested case. The court also held that Holden could amend his petition so that it can be reviewed as a non-contested case in the circuit court.

Nebraska

Diamond v. Dep't of Ins., 302 Neb. 892, (Neb. 2019)

The Nebraska Department of Insurance ("Department") issued an order against Petitioner Mark Diamond, a licensed insurance producer in Nebraska, holding that he violated three provisions of the Insurance Producers Licensing Act ("Act") and assessed him a $2,500 fine. Diamond appealed the Department's decision. Diamond was the chief executive officer and President of Bella Homes, LLC. Bella Homes "intended to buy homes from individuals who were struggling to make their mortgage payments and provide a 3-to 7-year repayment plan." Bella Homes "was expected to purchase the homeowner's mortgage from the existing lender and enter into a lease with the homeowner. . . ." Diamond formed this company at the request of a friend who had twice been convicted of fraud and could no longer handle another's finances. Bella Homes never purchased the home loans of its customers and did not protect the customer's homes from going into foreclosure. In 2012, the United States of America and the State of Colorado filed a civil action against Bella Homes, LLC and the individuals within the company, which included Diamond. The complaint alleged several violations of Mortgage Assistance Relief Services ("MARS") rules. In March 2012, Diamond confessed liability in defrauding distressed homeowners nationwide and a consent judgment was entered against him in the federal case. In December 2016, the Department filed an action against Diamond for violating §§ 44-4065(1) and 44-4509(1)(g) and (h) of the Act. The Director of the Department found that Diamond had a duty to report the federal consent judgment thirty days after the final disposition of the case pursuant to § 44-4065(1). The Director also found that, "although Diamond may not have been complicit in the fraudulent scheme, lending his reputation and partnering with someone convicted of fraud showed irresponsibility in business and violated § 44-4059(1)(h)." The director also found that because Diamond admitted to violating a MARS rule that included fraud, he violated § 44-4065(1)(g). The Department further held that because no Nebraska insurance consumers had been harmed and due to the length of time that had passed, that it would not revoke Diamond's license and assess him a $2,500 fine. Diamond appealed this decision to the district court. The district court affirmed the Department's decision stating that Diamond clearly violated §§ 44-4065(1) and 44-4509(1)(g) and (h). Diamond appealed this decision arguing that the district court erred in finding that in the federal consent judgment, Diamond admitted to fraud within the meaning of § 44-4059(1)(g), and the Nebraska Supreme Court moved the case to its docket.

The Nebraska Supreme Court held that, "under § 44-4059(1)(g), 'fraud' of an insurance producer means any act, omission, or concealment which involves a breach of legal or equitable duty, trust, or confidence justly reposed, and injurious to another or by which an undue and unconscientious advantage is taken of another." The Nebraska Supreme Court further held that Diamond's confession of violating

the MARS Rule fell into the definition of "fraud" under the Act; therefore, the district court's decision upholding the Department's order was affirmed.

New York

New York State Land Title Ass'n, Inc. v. New York State Dep't of Fin. Servs., 178 A.D.3d 611 (1st Dep't 2019)

In this case, Petitioner is challenging Insurance Law § 6409(d) and the New York State Department of Financial Services' ("DFS") Insurance Regulation 208 by stating that Insurance Law § 6409(d) is ambiguous as to the term "other consideration or valuable thing," and that certain provisions of Insurance Regulation 208 have a rational basis. DFS investigated licensed title insurers to assess how title insurers were calculating their premiums. As a result of the investigation, DFS uncovered that the title insurers were engaging in practices that ultimately resulted in higher premiums and closing costs for consumers, which violated Insurance Law § 6409(d). DFS found that insurers were reporting meals and entertainment expenses in "advertising, marketing and promotion, and travel, and 'other.'" DFS found that approximately 5.3% of premiums charged statewide violated Insurance Law § 6409(d). As a response, DFS promulgated Insurance Regulation 208, which delineates permissible and impermissible practices and prohibits offering inducements, such as meals, entertainment, gifts, and vacations. Insurance Regulation 208 was clear that the list was not exhaustive. Petitioner argued that Regulation 208 and its provisions were arbitrary and capricious, and that the regulation exceeds DFS's regulatory authority.

The appeals court found in favor of DFS, holding that Insurance Law § 6409(d) unambiguously prohibits an insurer from "offer[ing] or mak[ing], directly or *indirectly*, . . . any commission, any part of its fees or charges, or *any other consideration or valuable thing*, as an *inducement* for, or as compensation for, *any* title insurance business" (emphasis added). The appeals court further explained that the "word 'any' unambiguously indicates that this legislative prohibition was intended to be broadly construed, allowing for DFS to define 'any other consideration or valuable thing. . . .'" The court found that clarifying Insurance Law § 6409(d) through Insurance Regulation 208 was within DFS' regulatory authority. The appeals court upheld the lower court's ruling as to two other provisions that were adopted to clarify Insurance Law § 6409(d) and affirmed the decision to annul these provisions only.

Independent Ins. Agents and Brokers of New York, Inc. v. New York State Dep't of Fin. Servs., 65 Msc.3d 562 (Sup. Ct. Albany Co. July 31, 2019)

Independent Insurance Agents and Brokers of New York, Incorporated ("Plaintiff"), representing insurance agents, brokers, and financial advisors challenged the New York State Department of Financial Services' ("DFS") Amendment to NYCRR 224.0 *et seq*. The Amendment, also known as the Suitability and Best Interests in Life Insurance and Annuity Transactions, was issued by DFS on July 17, 2018. It adopted a uniform standard of care which must be met by agents and brokers, requiring them to act in the best interests of their client. Plaintiff offered many arguments including that the Amendment must be annulled for because the DFS exceeded its authority and that the regulation conflicts with the governing statutory scheme. DFS argued that it has broad supervisory power over the banking, insurance, and financial services. DFS further argued that the Amendment "is based on the principle that agents and brokers making recommendations about complex insurance transactions are more informed about market intricacies and potential impacts, and thus should be obligated to provide guidance in the best interests of the customer when making a recommendation."

The trial court agreed with DFS and held that the Amendment is a proper exercise of its regulatory power and that DFS complied with the State Administrative Procedure Act in adopting the Amendment. The court held that the insurance statues provide DFS with the authority to ensure "the continued safety and soundness of New York's banking, insurance, and financial services industries, as well as the prudent conduct of the providers of financial products and services, through responsible regulation and supervision."

Tennessee

Bible v. Tennessee Dep't of Commerce and Ins., Ins. Div., No. 17-1353-III (Aug. 28, 2019)

The Tennessee Department of Commerce and Insurance, Insurance Division (the "Department") filed an order revoking Petitioners Bible and Jacoway's producer licensure and assessed them each $250,000 in fines and costs. The Department ordered the Petitioners to cease and desist from engaging in insurance business. The Department's order found that from September 2010 through November 2012, the Petitioners "knowingly and intentionally failed to remit a total of some $407,038.31 of unearned premiums to 13 policyholders or their financing companies upon cancellation of the policyholders' insurance" through their insurance business, Truck Insurance Group, LLC ("TIG"). Petitioners challenged the Department's order on multiple grounds, with the most notable being that under

"Tennessee Code Annotated [§] 56-37-111, it is the responsibility of the insurance company, not TIG, to refund premium."

The chancery court affirmed the Department's order holding that the Petitioners had a statutory fiduciary duty to return unearned premiums to the policyholders or their finance companies upon cancellation of a policyholder's insurance policy. The court explained that Tenn. Code Ann. § 56-37-111 provides, "whenever a financed insurance contract is cancelled, the insurer shall return whatever gross unearned premiums are due under the insurance contract directly to the premium finance company. . . . In the event that the crediting of return premiums to the account of the insured results in a surplus over the amount due from the insured, the premium finance company shall refund the excess to the insured. . . . ." The court further stated that Tennessee case law supports its holding that Tenn. Code Ann. §56-37-111 places a fiduciary duty on an insurer to return unearned premium.

Cases in Which the NAIC Filed as *Amicus Curiae*

Maine Cmty. Health Options v. United States, No. 18-1023 (NAIC brief filed Sept. 6, 2019)

On September 6, 2019, the NAIC filed its fourth amicus brief supporting insurers who were paid only 12.6% of what they are owed under the Affordable Care Act's risk corridor program. The United States Supreme Court has consolidated the appeals of Moda Health Plan, Land of Lincoln, and Maine Community Health. The NAIC argued that the collective $12 billion owed by the Federal Government under the risk corridor program has destabilized the insurance market and undermined regulatory effectiveness. The defunding of the risk corridor program has had implications larger than a breach of contract between the insurers and the Federal Government. State regulators also relied on the Government to keep its promises and manage the risk to insurers entering this new marketplace. The Government's failure to do so compromised regulators' ability to set rates, accelerated the financial problems of new insurers induced to participate in the state exchanges, and left consumers with few choices for health coverage. The Supreme Court's decision in this case will determine whether the Federal Government can be relied upon to be a fair partner to state regulators not only in the area of health insurance, but in any joint initiative in future years.

The Supreme Court heard oral arguments in this consolidated action on December 10, 2019.

Amica Life Ins. Co. v. Wertz, No. 18-1455 (NAIC brief filed April 10, 2019)

The NAIC and the Interstate Insurance Product Regulation Commission ("IIPRC") filed a joint amicus brief with the Tenth Circuit Court of Appeals in this case on April 10, 2019. This appeal follows an order issued by the United States District Court for the District of Colorado, which upheld a life insurance policy's two-year suicide exclusion contained in a policy issued pursuant to the Uniform Standards approved by the IIPRC. The appellant continued to argue that Colorado's one-year suicide exclusion statute applied and that adoption of the IIPRC's Uniform Standards represented an unconstitutional delegation of authority to an interstate agency. The NAIC and IIPRC again argued that Colorado's adoption of the Compact model law, as well as its adherence to the Uniform Standards, was an appropriate delegation of authority to the IIPRC.

On July 24, 2019, the Court of Appeals issued an Order requesting the Colorado Supreme Court to exercise its discretion and accept the following constitutional question, "May the Colorado General Assembly delegate power to amend statutes to an interstate administrative agency?" On August 7, 2019, the Colorado Supreme Court issued an Order accepting the certified question but reframing it as follows, "May the Colorado General Assembly delegate power to an interstate administrative commission to approve insurance policies sold in Colorado under a standard that differs from Colorado statute?"

The Colorado Supreme Court heard oral arguments on this matter on February 11, 2020.

Guardian Flight, LLC v. Godfread, No. 19-1343, No. 19-1381 (NAIC brief filed June 18, 2019)

The NAIC submitted an amicus brief to the Eighth Circuit Court of Appeals in this case on June 18, 2019. The NAIC argued that two North Dakota air ambulance statutes were not preempted by the Airline Deregulation Act (ADA) as they were intended to regulate the business of insurance and did not relate to airline prices, routes or services. The NAIC also argued, in the alternative, that if the Court were to find that the statutes were in fact preempted by the ADA, both statutes are saved by the reverse preemption provision of the McCarran-Ferguson Act (MFA) because the purpose of the laws is to regulate the business of insurance. Oral arguments should be scheduled in the Spring or early Summer, 2020.

Journal of Insurance Regulation

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Submissions should relate to the regulation of insurance. They may include empirical work, theory, and institutional or policy analysis. We seek papers that advance research or analytical techniques, particularly papers that make new research more understandable to regulators.

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Cummins, J. David and Richard A. Derrig, eds., 1989. *Financial Models of Insurance Solvency*, Norwell, Mass.: Kluwer Academic Publishers.

Manders, John M., Therese M. Vaughan and Robert H. Myers, Jr., 1994. "Insurance Regulation in the Public Interest: Where Do We Go from Here?" *Journal of Insurance Regulation*, 12: 285.

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"Spreading Disaster Risk," 1994. *Business Insurance,* Feb. 28, p. 1.

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