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Abstract

Health insurance premiums have more than doubled over the past 10 years, which has been suggested to be the result of high market concentration in the health insurance industry. In this paper, we conduct a state-level analysis in which we examine the health insurance marketplace across the states and, more important, investigate the relation between market concentration and profitability. We find that there has been an increase in the number of insurers operating in most states over the sample period; accordingly, the extent of market concentration has declined in recent years. We also find evidence of a positive relation between market concentration and insurer profits but are unable to definitively determine if this result is due to anticompetitive behavior or greater efficiency of larger health insurers. To the extent that the provisions of the federal Patient Protection and Affordable Care Act (PPACA) will impact the number of insurers in the marketplace and/or the operational efficiency of health insurers, PPACA will likely affect the profitability of the health insurance industry.

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Introduction

Health care reform has been a contentious political issue for many years. In the center of the discussions lies the debate on what has been driving the steadily increasing cost of health insurance. A survey from the Kaiser Family Foundation finds that the average annual premiums for single and family coverage have increased significantly, rising at a rate more than three times as fast as the growth in national average wages.[1] Politicians have suggested that the health insurance industry is earning excessive profits by colluding and raising premiums. Additionally, consumer advocates such as Health Care for America Now believe that decreasing competition in the health insurance market is a major cause for such spiraling increases in health insurance premiums.[2]

Despite the great attention that has been focused on the substantial increase in health care costs (Hixon, 2012), few prior academic studies have empirically examined the relation between market concentration within the health insurance marketplace and insurers' underwriting profits. In this paper, we attempt to address this void in the literature by examining trends in the health insurance markets across states and, more important, investigating the potential relation between market concentration and the underwriting profitability of U.S. health insurers. As noted in prior literature, because competition among insurers is generally geographically focused, a state-level analysis is appropriate to explore this issue (for example, see Bajtelsmit and Bouzouita, 1998).

There are several hypotheses put forth in the economic and financial literatures that consider the potential relation between competition, industry

1. According to Kaiser Family Foundation's 2013 Employer Health Benefits Survey, the average annual premiums have increased from $2,196 and $5,615 in 1999, to $5,791 and $15,745 in 2012 for single and family coverages, respectively (Exhibit 1.11). This corresponds to increases of 164% and 180%, respectively. During the same period, national average wages only increased moderately, rising from $29,229.69 in 1999, to $42,498.21 or about 45%. (These statistics were obtained from the Social Security Administration. See *www.ssa.gov/oact/cola/central.html* for more information.)

2. For details, see Statement of David Balto Before House Judiciary Committee, Subcommittee on Regulatory Reform, Commercial and Antitrust Law, Hearing on "The Patient Protection and Affordable Care Act, Consolidation and the Consequent Impact on Competition in Healthcare," last accessed at *https://judiciary.house.gov/hearings/113th/09192013_2/Balto%20Testimony.pdf.*

concentration and profits.[3] These hypotheses propose varying reasons for the existence of a relation between market concentration and firm performance, including collusion, efficient operations and perceived product differentiation. Based upon the predictions of these prevailing hypotheses, we would expect to observe a non-trivial relation between profitability and market concentration. Yet, empirical research yields mixed results (see Caves and Barton, 1990; Haskel, 1990; Green and Mayes, 1991; Nickell, 1996; Hays and Liu, 1997). Within the insurance area, while several early studies (see Ippolito, 1979; Cummins and Harrington, 1988; Carroll, 1993) do not find any relation between concentration and performance, later studies do find evidence of such a relation (see Chidambaran, Pugel and Saunders, 1997; Bajtelsmit and Bouzouita, 1998; Choi and Weiss, 2005; Weiss and Choi, 2008). Such variation in prior empirical results may be due to a host of factors, including barriers to entry into the marketplace as well as market conditions specific to each industry (Aiginger, 1994). This suggests that a study specific to health insurers is warranted so as to determine whether there is a relation between market concentration and profitability within the health insurance industry.

In this paper, we conduct a state-level analysis of the health insurance marketplace. Specifically, we provide information on the marketplace and how the health insurance market structure has changed over time. We also empirically examine the relation between market structure and profitability, proxied by insurers' underwriting margins. By way of preview, our results indicate that during the period 2002 through 2010, the number of insurers varied widely across states. Additionally, we observe an increase in the average number of health insurers in the marketplace by nearly 66% during the sample period. At the same time, we also find that, while there was an increase in the degree of market concentration between 2002 and 2005, the level of market concentration has notably declined thereafter.[4] In our multivariate analysis, we find that market concentration and insurers' underwriting performance are positively related; However, similar to previous state-level studies (e.g., Carroll, 1993; Bajtelsmit and Bouzouita, 1998), we are unable to provide definitive evidence as to whether the positive profit-concentration relation is the result of collusion among health insurers or due to efficient operations.

3. Some prior literature considers competition, often measured as the number of firms in the market, while others focus on concentration. In this paper, our primary variable of interest is the Herfindahl-Hirschman Index (HHI) calculated using premium data, which is more commonly considered a measure of concentration. We focus on this measure and generally use the word "concentration" throughout this study because there may be some markets with a large number of insurers but with one or only a small number having significant market shares. In these areas, even though the number of firms in the market is high, it may not be viewed as a competitive marketplace. However, we fully recognize that competition and concentration are closely related and do consider the impact of the number of insurers in the marketplace on profitability as a robustness test.

4. For detailed information about the change in the number of health insurers and the level of market concentration in each state during the sample period, see Appendix A.

Our research makes an important contribution to existing literature. Despite the existence of a number of studies examining the relation between market competition and industry profitability within the various sectors of the insurance industry, we are unaware of any studies that have performed a multivariate analysis of the concentration-performance relation in health insurance markets, at the state level, using health insurer financial data from the NAIC.[5] Given the distinct differences in the characteristics of the U.S. health insurance and property-liability insurance markets and the ever-increasing important role that the health insurance industry plays in the overall economy, we believe our analysis of health insurance markets is an important and timely contribution to the existing literature relating to insurance markets in general and health insurance markets specifically.

This study also has important policy and regulatory implications. A significant aspect of the ongoing health care debate is whether the market conduct and operations of health insurers negatively impacts the affordability of health insurance. If it does, then government intervention through legislation such as PPACA,[6] or other federal regulatory remedies that influence health insurance market concentration or the efficiency of health insurer operations, would also likely influence health insurance costs incurred by consumers. For example, provisions of PPACA—such as those regarding medical loss ratios and rebating, limitations on rating factors, required essential benefits and coverage of preventive services, and prohibiting the use of pre-existing conditions—all serve to increase the affordability and availability of health insurance coverage to the population at large in the short run. However, some of these provisions, at least in the short run, may serve to increase claims costs, which could ultimately lead to higher premiums for everyone. Additionally, increased claims costs may result in consolidation within the health insurance industry and/or some insurers exiting the health insurance marketplace. This could potentially lead to less competition within the marketplace and even fewer choices for consumers. As such, our evidence regarding competition in health insurance markets provides important perspective to policymakers, regulators and other market participants.

We organize the remainder of our paper as follows. First, we discuss prior studies that are relevant to our analysis. We then discuss our data sources and methodology. Next, we provide summary information on the U.S. health insurance markets at the state level and present the results of our empirical analysis. Finally, we summarize our findings and make concluding remarks.

5. While studies such as Dafny (2010) and Dafny, Duggan and Ramanarayanan (2012) consider the effects of market concentration on premium levels, these studies rely on samples of employer-offered health insurance plans rather than the insurer-level data available in the NAIC health insurer database.

6. A summary of the major provisions of PPACA can be found on the U.S. Department of Health and Human Services website at *www.hhs.gov/healthcare/facts/timeline/timeline-text.html*. Additionally, there are a number of existing studies that discuss specific provisions of PPACA, some of which are discussed in the following section.

Previous Studies

The literature on market competition has its roots in industrial organization theory and several views are widely discussed and empirically tested. The structure-conduct-performance (SCP) paradigm posits that firms in less competitive markets have more market power and predicts a positive relation between market concentration and profits.[7] Another theory discussed in the literature, the relative market power (RMP) hypothesis, suggests that firms with larger market shares and differentiated products may exploit market share and gain larger profits.[8] Additionally, the efficiency structure hypothesis proposes that more efficient firms in the marketplace will enjoy higher market shares and higher profits.[9]

Many studies have examined the relation between market competition and firm performance in various insurance markets. Chidambaran, Pugel and Saunders (1997) find a positive relation between concentration and performance among a sample of property-liability insurers.[10] Choi and Weiss (2005) also examine competition among property-liability insurers and find support for the efficiency structure hypothesis. In addition, Weiss and Choi (2008) do not find evidence in support of the SCP hypothesis among a sample of U.S. automobile insurance

7. Proponents of the SCP paradigm explain market performance as being endogenously determined by a given market structure that is considered exogenous (Reid, 1987; Scherer and Ross, 1990). They argue that concentration causes collusion among larger firms. The result is greater market power and higher profits among these firms. Using data from sources such as the U.S. banking industry, researchers have tested whether the SCP paradigm applies to the banking industry. Prior studies typically use the HHI or n-firm concentration ratio (CRn) as the measure of competition. These studies find that banks in more concentrated local markets are associated with higher rates on SME loans (i.e., loans to small and medium-size enterprises) and lower rates on retail deposits (e.g., Berger and Hannan, 1989; and Hannan, 1991). However, market concentration, as measured by HHI or CRn was shown to be only weakly associated with measures of profitability after controlling for the market share of the bank on the right hand of the equation.

8. Proponents of this theory (e.g., Shepard, 1982; Rhodes, 1985), suggest that a firm's position in the market is associated with superior perception of market participants. There is some support for the RMP hypothesis in the literature. For example, Berger (1995) finds evidence of a positive relation between market share and profitability in the banking industry, even after controlling for concentration and efficiency.

9. The efficiency hypothesis proposed by Demsetz (1973) argues that larger firms enjoy economies of scale and possibly also economies of scope. It is this superior efficiency that enables the larger firms to garner a larger share of the market. Other researchers have also argued that the existence of a positive relationship between competition and firm performance may indeed support the efficiency hypothesis and both competition and profits are driven by the market share gains of efficient firms (e.g., Smirlock, Gilligan and Marshall, 1984; Rhoades, 1985; Smirlock, 1985; Shepherd, 1986; Berger, Demirguc-Kunt, Levine and Haubrich, 2004).

10. It should be noted that Chidambaran et al. (1997) measure concentration as the share of net premiums of the four largest firms. When the HHI is used as an alternate measure of concentration, no relation is observed between concentration and firm performance.

companies and find mixed results relating to the relative market power and efficiency structure hypotheses.

Additionally, Carroll (1993) and Bajtelsmit and Bouzouita (1998) both examine competition and profits in insurance markets at the state level and are the most relevant to our current analysis.[11] Carroll (1993) examines both the SCP hypothesis and the efficiency hypothesis using state-level workers' compensation data. Carroll (1993) does not observe the positive relation between market concentration and profits predicted by the SCP and efficiency hypotheses.[12] However, she suggests that the construction of some of the variables may lead to this result and her findings may, therefore, not be entirely inconsistent with the SCP and efficiency hypotheses. Bajtelsmit and Bouzouita (1998) examine the relation between market competition and profitability in the U.S. personal automobile insurance market and, unlike Carroll (1993), they find a significant and positive impact of market concentration on profitability for combined liability and physical damage lines. Bajtelsmit and Bouzouita (1998) conclude that their analysis provides evidence in support of the SCP hypothesis. The authors note that the results could also provide support for the efficiency hypothesis in that "higher profitability in the more concentrated states is the result of greater efficiency of large firms as suggested by Demsetz (1973)" but are unable to provide conclusive evidence on its validity. When considered jointly, the findings of Carroll (1993) and Bajtelsmit and Bouzouita (1998) indicate that no strong and consistent support has emerged for explaining the state-level concentration-profits relation. Additionally, these varying results suggest that the relation may differ across industries or even business segments within the same industry.

Other studies have utilized various data sources and methods of analyses to examine topics related to competition in health insurance markets. For example, Robinson (2004) uses data from sources such as Goldman Sachs Global Equity Research, investor reports and InterStudy directories to perform a summary examination of trends in state-level health insurance market concentration and performance from 2000 to 2003. Dafny (2010) uses a sample of employer-offered health plans and finds evidence that health insurers exercise market power to charge more profitable employers higher premiums. Using a similar sample, Dafny, Duggan and Ramanarayanan (2012) also find evidence of a positive relation between concentration and premiums in health insurance markets.

From a broad perspective, our analysis contributes to the body of literature that has grown substantially following the enactment of PPACA, which examines

11. Similar to Carroll (1993) and Bajtelsmit and Bouzouita (1998), we consider both the SCP and the efficiency hypotheses in the current study.

12. The study employs the market share of direct writers in order to evaluate the efficiency hypothesis, as it is hypothesized that a link exists between efficient operations and direct writers.

various aspects of health insurance market operations.[13] For example, McCue, Hall and Liu (2013), using NAIC data, find evidence that PPACA's minimum medical loss ratio requirement leads individual health insurers to reduce cost ratios and operating margins. Karaca-Mandic, Abraham and Simon (2013) also use NAIC data in their analysis and provide evidence on the appropriateness of the medical loss ratio as a target measure of market power in individual health insurance markets. Additional studies discuss the PPACA legislation and various topics closely related to the enactment of the legislation (e.g., Harrington, 2010a; Harrington, 2010b; Monahan and Schwarcz, 2013; Eibner, Cordova, Nowak, Price, Saltzman and Woods, 2013), as well as evaluate differences between individual health insurance take-up at the national and state levels (Parente, Feldman, Abraham and Xu, 2011). While prior studies do consider a variety of issues related to the health insurance industry, our state-level analysis provides a much more complete examination of the relation between market concentration and profitability by including a larger sample size and a more in-depth analysis.

Hypothesis, Data and Methods

Hypothesis

Our hypothesis considers the relation between state-wide health insurance market concentration and state-wide health insurer profits. The previously discussed, SCP and efficiency hypotheses both suggest a positive relation between profit and concentration, although the former attributes the relation to anticompetitive behavior, while the later suggests the relation is derived from comparative advantages in production/services. Given empirical evidence from prior studies,[14] we propose the following hypothesis:

> *There is a positive relation between health insurance market concentration and health insurance market underwriting profit at the state level.*

13. Topics considered in this area of the literature consider numerous facets of health insurance market operations following the enactment of PPACA. For example, Jost (2014) provides perspective on the implementation of PPACA; Sommers, Kenney and Epstein (2014) provide evidence on the influence of Medicaid expansion efforts; Grob, Schlesinger, Davis, Cohen and Lapps (2013) consider PPACA's efforts to assist consumers in health insurance coverage; Buchmueller, Carey and Levy (2013) evaluate whether PPACA will lead employers to drop health insurance coverage; Kapur, Karaca-Mandic, Gates and Fulton (2012) examine the influence of small-group health insurance reforms on firm growth; and Jones and Greer (2013) address states' political environments and health insurance exchanges.

14. As discussed previously, Carroll (1993) does not find a relation between concentration and profits, while the results of Bajtelsmit and Bouzouita (1998) provide support of a positive relation between concentration and profits.

A positive and statistically significant coefficient on the market concentration measure in the ensuing empirical analysis will support this hypothesis. Such evidence would be consistent with both the SCP and efficiency structure theories. However, we do want to acknowledge a limitation of our study. Because both the SCP and efficiency structure theories propose a positive relation between market concentration and profitability, a finding supporting our hypothesis has two alternative explanations: 1) there is collusion among insurers with large market shares; or 2) insurers with large market shares operate more efficiently. These alternative explanations could have very different impacts on consumers. More specifically, if this finding is the result of exertion of market power and collusion by health insurers, this could ultimately lead to higher health insurance costs. Alternatively, if the relation is the result of more efficient operations, this could translate to lower premiums for insureds. As such, regulations or other market factors that influence concentration or the efficiency of firm operations within health insurance markets are likely to have non-trivial consequences for health insurance consumers and future study is needed.

Data

To test our hypothesis, we take advantage of the comprehensive data from the NAIC health insurance company statutory filings supplied by SNL Financial. The NAIC database consists of financial and operating data that all insurance companies are statutorily required to provide to state insurance regulators. We utilize data from the health annual statement of NAIC filings, which contain detailed operating information specific to insurers' specializing in health insurance lines, including revenues, expenses, income, managed care information, physician remuneration information and by-state, by-line premiums and losses at the firm level.[15] By aggregating this information to the state level, the dataset allows us to examine health insurance markets using a large sample of private insurers that are deemed by the NAIC as health insurers and operate across multiple health-related lines of insurance.

15. While we believe that the NAIC health insurance database provides an appropriate characterization of the health insurance market during our sample period, restricting our sample to only firms that file health annual statements with the NAIC inherently results in the exclusion of life insurers with health insurance business from our sample. An examination of the Supplemental Health Care Exhibits in the life insurance database indicates that, of the total combined health premiums earned by health and life insurers, on average, more than 90% of the premium volume is reported by health insurers. Additionally, Schedule T of the life insurance annual statements combines premiums for accident and health coverages. Therefore, including this data would provide an inaccurate representation of the health insurance market because it would not distinguish between accident and health insurance premiums for life insurers from this data sources. Finally, while the Supplemental Health Care Exhibit to the life insurance annual statements do separately report premiums specifically for health products, these supplements are only available since 2010. As such, we believe the omission of life insurers does not significantly bias our results but allows us to utilize a much longer sample period.

Our dataset has advantages over those used in prior studies such as Dafny (2010) and Dafny et al. (2012), which utilize employer-level plan data for selected geographic regions only; and Parente, Feldman, Abraham and Xu (2011), which use data from four large employers with operations in multiple states. More specifically, because we utilized the NAIC database, our sample is larger and more complete than those used in prior studies, as ours includes information on all private health insurers required to file regulatory statements with the NAIC in nearly all states. As such, our results are more generalized than findings from the prior studies mentioned above.

With the exception of California, we include in our sample all insurers operating in all states from 2002 to 2010[16] that filed a health annual statement with the NAIC.[17] California is excluded due to data limitations on California-domiciled health insurers.[18] We then aggregate insurer-level data to the group level in order to ensure variables such as the HHI or market share measure reflect the combined operations of insurer conglomerates rather than the separate operations of multiple individual-affiliates within a group. The NAIC data reports operations of a given insurer by state (such as premiums and losses) which allows us to aggregate the premiums and losses of health insurance groups to the state-level. Our final sample is then a panel of state-year observations.

Methods

An appropriate test of our hypotheses considers the relation between state-level market concentration and the performance of health insurers while

16. We only include data through 2010, given the passage of PPACA in that year. Specifically, its provisions were set to go into effect over a number of years and these major changes to services covered and policy structure, as well as guaranteed insurability and limitations on medical loss ratios, are likely to impact health insurers in a variety of ways, some of which are discussed in later sections of this paper. As such, the purpose of this paper is to determine the relationship between market concentration and profitability pre-PPACA. An empirical analysis of the full impact of PPACA will not be possible until all of the provisions have gone into effect and there are several years of post-PPACA implementation data to examine. At that time, it will be possible to determine if there have been changes to market concentration, if those changes can be related to the implementation of the provisions of PPACA, and if this has had an impact on the profitability of the health insurance market. We leave this for further research.

17. It should be noted that there is considerable variation in the size of the states. We include a state population variable to help control for the potential impact of this variation. Additionally, we perform an unreported regression analysis in which we exclude observations with Studentized residuals greater than three or smaller than negative three. Our results remain consistent, suggesting our results are unlikely to be driven by any highly influential observation.

18. We exclude the state of California from our analysis due to the fact that a significant amount of data for California health insurers is missing from the NAIC annual statement database. We attempted to obtain such information directly from the California Department of Insurance but were advised that their data is also incomplete because, in California, only certain segments of the health insurance markets are required to file annual statements with the California Department of Insurance.

controlling for other factors that may influence market performance. We follow prior studies such as Bajtelsmit and Bouzouita (1998) and measure industry performance as the ratio of net premiums earned less losses incurred divided by net premiums earned. The measure of performance utilized in the current study does not consider expenses, because insurers do not report such information by state. As noted in Bajtelsmit and Bouzouita (1998), although state-level studies are common in the insurance area and are appropriate to examine the impact of market concentration on profitability when markets are geographically focused, this is a potential drawback of state-level studies. However, the inclusion of independent variables that are likely to impact expenses can help control for some, if not all, of the potential variation of expenses across states. As an additional attempt to address this potential issue, we replicate our regression analysis including only insurers that do business in a single state (in which case all of the expenses incurred by the insurer would be attributable to business in that single state) and the results are consistent with those presented in the following section.

Following prior studies in the insurance literature, we measure concentration as the state-level HHI based on direct premiums written. Formally, we estimate the following model:

$$Performance_{jt} = \alpha + \beta_1 Concentration_{jt} + \beta_n' \lambda_{jt} + \varepsilon_{jt} \quad 1)$$

where,

$Performance_{jt}$ = the ratio of net premiums earned less losses incurred divided by net premiums earned in state *j* in year *t*[19]

$Concentration_{jt}$ = the state-level HHI, which is calculated as the sum of the squares of insurer *i*'s market share (based on direct premiums written) in state *j* during year *t*

λ_{jt} = a vector of state-level variables to control for market performance in state *j* during year *t*

We first use ordinary least squares (OLS) regressions to estimate Equation 1. However, due to endogeneity concerns regarding market concentration noted in prior studies, we also use an instrumental variables (IV) model approach. Specifically, it is possible that unobserved factors influence both concentration and performance in each market. Additionally, there may be some simultaneous causality bias. As such, we instrument $Concentration$ with both the one-year lag of $Concentration$ in state *j*'s neighboring state (similar to the approach used by McShane, Cox and Butler, 2010) and the number of insurers operating in state *j*

19. The lines of business considered are those reported on the NAIC health annual statement by every insurer in the state, which can include individual comprehensive, group comprehensive, vision, dental, Medicare, Medicare supplement, Medicaid, federal employee health benefits, stop-loss, disability and long-term care insurance.

during year *t* and test the concentration variable for the presence of endogeneity.[20] The null hypothesis of the endogeneity test is that the regressor is exogenous. The results of the tests indicate rejection of the null hypothesis at the .0001 level, which indicates that the regressor is endogenous.[21] As such, while we report the results using both the OLS and IV approaches, we focus our discussion of the results in the following section on the IV models.[22] The results of under-identification tests and the Sargan-Hansen tests indicate that all models are properly identified and the variables used as instruments are valid instruments. In addition, all models include robust standard errors.[23]

Concentration is our primary variable of interest. If we find a statistically significant coefficient on *Concentration*, this would provide evidence of a relation between market concentration and profitability within the health insurance industry.

With the variables represented by vector λ_{jt}, we control for a number of other state-level factors that could potentially impact underwriting profits. First, we include the percentage of net premiums written in each of the lines of business, as different insurance products may be associated with varying levels of profitability. The omitted line is the other category, which includes stop-loss, disability and long-term care coverage.[24] We also include a measure of insurers' underwriting risk to control for the possibility that uncertainty in claims levels impacts insurers' profitability.

Additional state-level measures included in λ_{jt} are the uninsured rate, the unemployment rate, median income, state population and the number of large employers in each state in each of the sample years. We expect higher levels of persons without health insurance (i.e., higher uninsured rate) to be indicative of factors influencing insurer profits such as underwriting risk or the demand for health insurance. Because employment levels are likely correlated with the demand in the group health insurance market, higher unemployment levels might be associated with lower demand for group health insurance. All else being equal, this might, in turn, lead to lower underwriting profits, especially if insurers in the state have more business in the group health insurance lines. Also, because large

20. State *j*'s neighbor is any state that shares a geographic border with state *j*. Because Alaska and Hawaii do not have bordering states, we are forced to exclude these states from the IV regression analyses. The exclusion of California (discussed earlier) and the requirement of a one-year lag for the neighboring state instruments results in 376 observations for the IV regression models, as opposed to the 440 observations included in the OLS regression models.

21. Specifically, we utilize the "endog" option in Stata to test whether the concentration variable is, in fact, endogenous.

22. In addition, we estimate all models with year dummies included.

23. Given that the measure of underwriting risk does not have much variation for the states across years, it is not feasible to include state dummies or use any type of clustering approach. However, in unreported results, we find that our main results are robust to alternative model specifications that include state and year effects.

24. The disability, stop-loss and long-term care lines are combined into a single category, as these lines represent a small portion of the business written by health insurers and vary in reporting methods during the sample period.

employers may choose to self-insure health benefits and utilize health insurers for administrative services only arrangements or stop-loss insurance, differences in the number of large employers in a state may be associated with differences in health insurer profitability.

Higher income individuals are more likely to have access to health insurance and are better able to afford the out-of-pocket costs associated with health care services. As such, these individuals may be healthier, relative to lower income individuals, demand more health insurance and/or purchase greater amounts of non-comprehensive lines of insurance (such as dental and vision insurance), which could impact the profitability of health insurers. Also, the size of the state market could influence health insurer profitability. For example, insurers in states with larger populations, all else being equal, are expected to have a greater ability to spread fixed costs over a larger base of potential policyholders. It is also possible that health insurers in states with larger populations have greater flexibility in physician network arrangements because of a higher supply of physicians. In both cases, this could lead to greater profitability for health insurers. We therefore include the natural logarithm of the state population as a proxy for market size.

In λ_{jt}, we also include various state-level population demographic variables intended to control for the potential influence of the health and socioeconomic status of the population on insurer profits. This includes the number of deaths per 1,000 people and the percentage of the population that may be considered higher health risks. If states with a higher number of deaths are associated with longer hospital stays and more treatment, especially more expensive potentially life-extending treatments, we would expect this variable to be negatively related to insurer profitability. However, if more deaths are associated with shorter hospital stays and less treatment due to the hasty death of individuals, we might expect this variable to be positively related to profitability, as claims costs would be lower, all else being equal. In addition, given the health risks associated with obesity, smoking and drinking, we would expect all three of these variables to be negatively related to profitability as these factors would all likely increase claims costs.

Lastly, we include the five-year Treasury yield as a measure of market performance. If the overall market is performing well, higher investment returns may allow insurers to reduce the cost of coverage to remain competitive or attempt to gain greater market share. If this is the case, we would expect higher investment returns to be associated with lower underwriting profits. Complete variable descriptions are presented in Table 1 and summary statistics are presented in Table 2.

Table 1:
Variable Definitions

Variable	Definition
Dependent Variables	
Profits	Net premiums earned in state *j* for all insurers in year *t* less losses in state *j* for all insurers in year *t* incurred divided by net premiums earned in state *j* for all insurers in year *t*.
Independent Variables	
Concentration	HHI of state *j* calculated as the sum of the squares of insurer *i*'s market share (measured as direct premiums written) in state *j* during year *t*.
Competition	Number of insurers with some direct premiums written in state *i* during year *t*.
Underwriting Risk	Variance of the loss ratio measured as total losses incurred divided by direct premiums written of insurers operating in state *i*.
Proportion Monoline	The proportion of premiums written by monoline insurers in state *j* during year *t*.
Percent Federal Employee	The percentage of premiums written in federal employee benefits program coverage, for state *j* during year *t*.
Percent Group Comprehensive	The percentage of premiums written in group comprehensive coverage, for state *j* during year *t*.
Percent Individual Comprehensive	The percentage of premiums written in individual comprehensive coverage, for state *j* during year *t*.
Percent Medicaid	The percentage of premiums written in Medicaid coverage, for state *j* during year *t*.
Percent Medicare	The percentage of premiums written in Medicare coverage, for state *j* during year *t*.
Percent Medicare Supplemental	The percentage of premiums written in Medicare Supplemental coverage, for state *j* during year *t*.
Percent Vision	The percentage of premiums written in vision coverage, for state *j* during year *t*.
Percent Dental	The percentage of premiums written in dental coverage, for state *j* during year *t*.
Percent Other	The percentage of premiums written in disability, long-term care and stop-loss coverages, for state *j* during year *t*.
T-Bill Rate	The yield on the five year Treasury security for year *t*.
Uninsured	The number of persons without health insurance, per capita, for state *j* during year *t*.
Unemployment	The number of unemployed, per capita, for state *j* during year *t*.
Large Employers	The percentage of establishments with 1,000 or more employees in state *j* during year *t*.
Median Income	The median income, in 2010 dollars, of persons in state *j* during year *t*.
State Population	The natural logarithm of the population of state *j*.
Deaths	The number of deaths per 1,000 people in state *j* during year *t*.
Obese	The number of persons given by CDC data as obese, per capita, in state *j* during year *t*.
Smokers	The number of persons, per capita, using tobacco cigarettes during year *t* in state *j*.
Heavy Drinkers	The number of persons, per capita, consuming, on average, two or more drinks per capita in state *j* during year *t*.

Table 2:
Summary Statistics

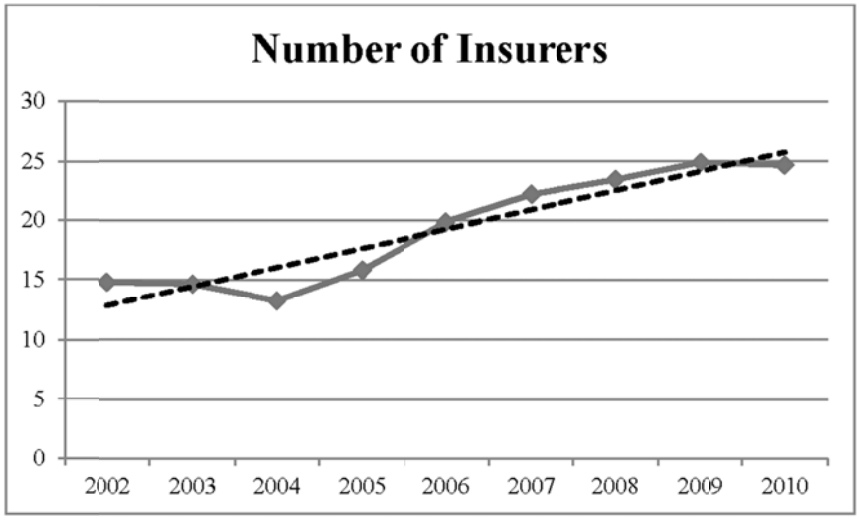
Variable	Mean	Std. Dev.	Min	Max
Independent Variables				
Profits	0.1476	0.0323	0.0639	0.2165
Dependent Variables				
Concentration	0.3812	0.2064	0.0814	0.9900
Competition	19.3220	9.7064	2.0000	50.0000
Underwriting Risk	0.0007	0.0011	0.0000	0.0075
Proportion Monoline	0.0972	0.1480	0.0001	1.0000
Percent Federal Employee	0.0861	0.0602	0.0000	0.3525
Percent Group Comprehensive	0.5594	0.1390	0.0742	0.9210
Percent Individual Comprehensive	0.0588	0.0437	0.0000	0.3076
Percent Medicaid	0.0900	0.1071	0.0000	0.5642
Percent Medicare	0.1237	0.1116	0.0000	0.7161
Percent Medicare Supplemental	0.0327	0.0321	0.0000	0.3160
Percent Vision	0.0054	0.0137	0.0000	0.1965
Percent Dental	0.0239	0.0285	0.0000	0.2582
Percent Other	0.0200	0.0341	0.0000	0.6274
T-Bill Rate	3.3756	0.9214	1.9300	4.7500
Uninsured	0.1352	0.0385	0.0438	0.2535
Unemployment	0.0292	0.0099	0.0120	0.0743
Large Employers	0.0938	0.0329	0.0000	0.2097
Median Income	10.7487	0.1638	10.2874	11.1281
State Population	15.0703	0.9677	13.1224	17.0402
Deaths	44.9003	40.7765	3.0000	173.7600
Obese	0.2511	0.0364	0.1600	0.3540
Smokers	0.2037	0.0400	0.0580	0.3260
Heavy Drinkers	0.0514	0.0127	0.0190	0.0870

Summary Statistics

Before reporting the results of the empirical model, we first take a closer look at the state health insurance markets and how these markets have changed over time. Figure 1 and Figure 2 show the average number of insurers and average levels of concentration during the sample period.[25] These figures provide some evidence that the average number of health insurers operating in the marketplaces has increased over time. Additionally, while there was some growth in concentration in the early part of the sample, the U.S. health insurance markets overall have become less concentrated since 2005.

In examining the change during the sample period for each individual state, we find that, on average, every state experienced a positive annual growth in the number of insurers operating in its jurisdiction. Additionally, average growth rates varied significantly across the states, from less than 1% to nearly 28%. When more closely examining changes in market concentration across the states, we find that health insurance markets in 19 states have become less concentrated, while the remaining 30 states experience an average annual increase in market concentration, with the largest increase being nearly 40%.

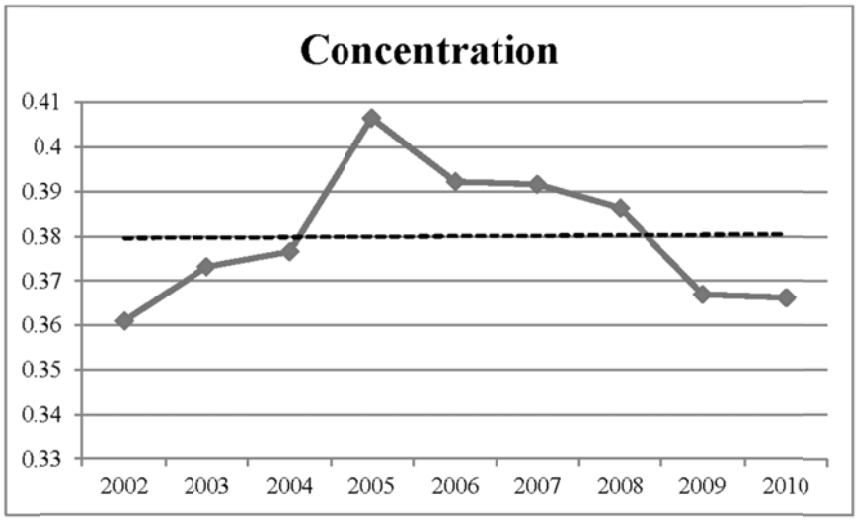
Figure 1:
Average Number of Insurers per State by Year



Note: The dashed line is the linear trend line over the sample period. For detailed by-state information, see Appendix A. As noted in the paper, this does not include California.

25. Detailed information regarding the number of insurers operating in each state, the level of market concentration in each state, and the average change in these variables during the sample period can be found in Appendix A.

Figure 2:
Average Concentration Across All States by Year



Note: Dashed line is the linear trend line over the sample period. For detailed by-state information, see Appendix A.

Intense debate relating to health care reform has often centered on the extent to which changes in the health insurance marketplace have led to changes in the cost of health insurance. Although we are unable to obtain the exact price consumers pay for health insurance policies, we consider a proxy: direct premiums written per enrollee in each state.[26] We find that all but four states in our sample have experienced average annual increases in premiums per enrollee.[27] This is consistent with findings in prior studies and surveys that consumers are paying more for health insurance than they have in the past.

In an effort to determine what may be driving this increase in health care costs, we next consider a measure of claims costs (i.e., health insurance losses paid per enrollee) during this same period.[28] We find that for all but three states, the average annual change in losses per enrollee was positive. Additionally, the three states in which the average change in losses per enrollee was negative are three of

26. This variable is calculated using data from the state pages of the NAIC annual health insurer filings. Specifically, we divide the sum of the direct premiums written for all insurers in a given state by total enrollment for all insurers in the same state.

27. Detailed information concerning premiums written per enrollee, losses per enrollee and the average annual changes in these variables over time for each state is reported in Appendix B.

28. This variable is calculated using data from the state pages of the NAIC annual health insurer filings. Specifically, we divide the sum of the provision of health care services paid by all insurers in a given state by total health enrollment for all insurers in the same state.

the four states that experienced a decline in the average direct premiums written per enrollee. In fact, comparing the average change in price to the average change in claims costs during the period, we find that the average change in price is highly correlated with the average change in claims costs. This seems to suggests that the increase in the cost of coverage is primarily driven by increases in claims cost.

If the increase in the price of health insurance is indeed driven by an increase in claims costs, we would expect to see little change in the loss ratio of the health insurers, as insurers adjust premiums to reflect changes in claims experience. This is what we find when we calculate the loss ratio by dividing losses paid by direct premiums written.[29] The loss ratios of health insurers exhibit little change over the sample period: the average annual change in the loss ratio of health insurers across states is close to 1%, ranging from –1.06% to 0.98%.[30]

Empirical Model Results

The empirical model results are presented in Table 3.[31] As shown in IV – Model 1, we find that the impact of market concentration on underwriting profits is statistically significant and positive, suggesting that states with greater market concentration (as indicated by the higher HHI) are associated with higher underwriting profits.[32] In terms of economic significance, if evaluated at the mean, a 10% increase in market concentration is associated with a 3.4% increase in underwriting profits at the state level. This result provides support for our

29. These are the same data elements gathered from the state pages that are used in calculating premiums and losses per enrollee.

30. For more detailed information on the loss ratio of the state and changes in loss ratios over the sample period, see Appendix C.

31. It should be noted that Idaho has a large premium-to-enrollee ratio. Because this could be a reporting error, we re-run the models reported in Table 3, dropping this state from the analysis to ensure that this state is not driving the results observed. Results excluding this state are consistent with those reported here. Additionally, we estimate the results using two-way fixed effects and the results are similar to those reported here with one notable exception; i.e., the concentration variable is positive and significant in the OLS models. However, given the loss of degrees of freedom and the reduction of cross-sectional variation associated with this modeling approach and the lack of variation in the underwriting risk measure across the years, we elect to present the results including just the time effects. Finally, we add two additional variables: the first is equal to one for states with prior approval rate regulation for individual markets and zero otherwise; and the second is equal to one for state with prior approval rate regulation for group markets and zero otherwise. New Hampshire is excluded from this analysis because it is the only state with different rate regulations for small and large group markets. The results are generally consistent with what is reported here and neither rate regulation variable is significant.

32. Other papers use the number of firms operating in a given market as a measure of competition. As such, we construct a model similar to that which is reported here but replace our measure of concentration with this measure of competition. When we consider a measure of competition, or the number of insurers in the state, we find a significant negative relation, suggesting that greater levels of competition results in lower profitability.

hypothesis that market concentration has an impact on the underwriting profitability of health insurers in the market.

Coefficients of several control variables also are significant. We find that insurers in states with a higher proportion of uninsured individuals are associated with larger profits and health insurers in states with larger populations and a higher proportion of large employers also exhibit higher profits. In addition, states with higher median income and a larger percentage of obese individuals are associated with lower profits. Interestingly, even though the share of Medicare and Medicaid business in our sample is approximately 20%, on average, these variables do not explain market concentration or health insurer profitability. Given that enrollment in both programs are likely to increase in the future, it will be interesting and important for future researchers to consider how the size of these programs impacts future levels of market concentration and health insurer profitability.[33]

33. Note that one of the major provisions of PPACA is the expansion of Medicaid. In addition, the number of individuals who collect from Medicare will increase with the aging population, particularly as it relates to the retirement of the baby boomer generation.

Table 3:
Model Results

	OLS – Model (1)	IV – Model (1)	OLS – Model (2)	IV – Model (2)
Concentration	-0.0118	0.1367***	0.0024	0.1055***
	[0.013]	[0.045]	[0.014]	[0.036]
Underwriting Risk	3.0161	-0.8377	0.3043	-3.7888*
	[2.236]	[3.223]	[1.892]	[2.117]
Proportion Monoline			0.0666***	0.1144***
			[0.020]	[0.026]
Percent Federal Employee	0.0397	-0.0208	0.0899	0.1065*
	[0.070]	[0.101]	[0.056]	[0.062]
Percent Group Comprehensive	0.0400	-0.0489	0.0552	0.0124
	[0.062]	[0.090]	[0.044]	[0.047]
Percent Individual Comprehensive	0.0412	-0.1554	0.0665	-0.0627
	[0.081]	[0.111]	[0.072]	[0.081]
Percent Medicaid	0.0231	-0.0137	0.0520	0.0479
	[0.063]	[0.092]	[0.048]	[0.055]
Percent Medicare	0.0404	-0.0237	0.0752	0.0585
	[0.064]	[0.093]	[0.048]	[0.054]
Percent Medicare Supplemental	0.2420***	-0.2223	0.2584***	-0.0612
	[0.091]	[0.205]	[0.081]	[0.123]
Percent Vision	-0.0313	0.0327	-0.3085*	-0.3758
	[0.167]	[0.376]	[0.172]	[0.314]
Percent Dental	-0.0320	0.1096	-0.0344	0.0340
	[0.088]	[0.122]	[0.074]	[0.077]
T-Bill Rate	0.0043**	0.0027	0.0047**	0.0039*
	[0.002]	[0.003]	[0.002]	[0.002]
Uninsured	0.2813***	0.1679***	0.2523***	0.1316**
	[0.055]	[0.060]	[0.055]	[0.055]
Unemployment	0.0719	-0.2101	0.0929	-0.0893
	[0.202]	[0.265]	[0.199]	[0.229]
Median Income	-0.0208	-0.0429**	-0.0161	-0.0297*
	[0.016]	[0.020]	[0.015]	[0.016]
State Population	0.0048	0.0168**	0.0080*	0.0184***
	[0.004]	[0.007]	[0.004]	[0.006]
Deaths	-0.0001	-0.0001	-0.0001*	-0.0001*
	[0.000]	[0.000]	[0.000]	[0.000]
Obese	-0.0732	-0.1813***	-0.0787	-0.1679***
	[0.052]	[0.068]	[0.051]	[0.058]
Smokers	0.0109	-0.0532	-0.0158	-0.0658
	[0.058]	[0.065]	[0.055]	[0.058]
Heavy Drinkers	-0.2163	-0.1038	-0.2244	-0.1585
	[0.141]	[0.159]	[0.138]	[0.145]
Large Employers	0.2080***	0.2235***	0.1797***	0.1470**
	[0.058]	[0.062]	[0.061]	[0.067]
Constant	0.2167	0.3748	0.1002	0.1516
	[0.192]	[0.251]	[0.182]	[0.208]
Observations	440	376	440	376
R-squared	0.2517	-0.0574	0.2820	0.1557

This table presents the results of estimating equation 1. All models include year dummies and robust standard errors are reported. Columns with "OLS" in the title include the results when ordinary least squares methods were used, while columns with "IV" in the title indicate the results when an instrumental variables approached was used. The dependent variable in all models is the difference in state-wide net premiums earned and losses incurred, scaled by net premiums earned, for a given state, during a given year. The independent variables are defined as follows: *Concentration* is the HHI of a given state, in a given year, based on direct premiums written; *Competition* is the number of insurers with positive direct premiums written in a given state, in a given year; *Underwriting Risk* is the variance of the state-level loss ratio; *Proportion Monoline* is the proportion of premiums written by monoline insurers in a given state, in a given year; *Percent Federal Employee* is the percentage of premiums written in federal employee benefits program coverage in a given state, in a given year; *Percent Group Comprehensive* is the percentage of premiums written in group comprehensive coverage in a given state, in a given year; *Percent Individual Comprehensive* is the percentage of premiums written in individual comprehensive coverage in a given state, in a given year; *Percent Medicaid* is the percentage of premiums written in Medicaid coverage in a given state, in a given year; *Percent Medicare* is the percentage of premiums written in Medicare coverage in a given state, in a given year; *Percent Medicare Supplemental* is the percentage of premiums written in Medicare supplement coverage in a given state, in a given year; *Percent Vision* is the percentage of premiums written in vision coverage in a given state, in a given year. *Percent Dental* is the percentage of premiums written in dental coverage in a given state, in a given year; *Percent Other* is the percentage of premiums written in disability, long-term care and stop-loss coverages in a given state, in a given year; *T-Bill Rate* is the yield on the five year Treasury security in a given year; *Uninsured* is the number of persons without health insurance, per capita, in a given state, in a given year; *Unemployment* is the number of unemployed, per capita, in given state, in a given year; *Large Employers* is the percentage of establishments with 1,000 or more employees in a given state, in a given year; *Median Income* is the median income, in 2010 dollars, of persons in a given state, in a given year; *State Population* is the natural logarithm of the population of a given state, in a given year; *Deaths* is the number of deaths per 1,000 people in a given state, in a given year. *Obese* is the number of persons given by the U.S. Centers for Disease Control and Prevention (CDC) data as obese, per capita, in a given state, in a given year; *Smokers* is the number of persons, per capita, using tobacco cigarettes in a given state, in a given year; *Heavy Drinkers* is the number of persons, per capita, consuming, on average, two or more drinks per capita in a given state, in a given year. Note that *** p<0.01, ** p<0.05, * p<0.1.

As previously discussed, both the SCP and efficiency structure hypotheses predict a positive profit-concentration relation and, as noted in previous state-level insurance studies (e.g., Carroll, 1993; Bajtelsmit and Bouzouita, 1998), the two hypotheses are difficult to disentangle at the state level. While property/casualty studies use the proportion of premiums written by direct writers as a proxy for efficiency (e.g., Carroll, 1993), because of differences in industry composition and reporting requirements, we must construct an alternative measure. We utilize the proportion of premiums written by monoline health insurers in a given state during a given year to account for potential differences in efficiency of operations among health insurers operating in the state.[34] As shown in IV – Model 2, when this variable is included as an additional variable in our models, its coefficient is positive and significant, while the coefficient on the concentration measure remains significant and positive.

The result of the monoline variable is important because, while it does not provide definitive proof of the efficiency structure hypothesis, it does not rule it out, either. As such, it is possible the profit-concentration relation is not the result of anti-competitive behavior on the part of health insurers. More specifically, if, as in other segments of the insurance industry, differences in efficiency exist between monoline and multi-line health insurers, then our results suggest that efficient operations of large firms may ultimately influence profit levels. Given that we are unable to conclude whether the relation observed between concentration and profitability conclusively supports the SCP or efficiency structure hypothesis, future study is certainly warranted.

34. Many studies in the property-liability, life and health industries indicate that product line diversification influences factors relating to efficiency, such as economies of scale, economies of scope, internal capital markets and agency costs (e.g., Meador, Ryan and Schellhorn, 1997; Cummins, Weiss and Zi, 2007; and Liebenberg and Sommer, 2008). While certainly not a perfect measure, given evidence of a relation between the efficiency of insurer operations and the product strategy of insurers, we propose that the use of the proportion of monoline insurers operating in a given state is a reasonable control for differences in operational efficiency. When we analyze health insurer expense ratios at the firm level we find evidence that monoline health insurers are associated with higher expense ratios than multi-line insurers. This suggests that these insurers may be less efficient.

Conclusion

In this study, we examine the market structure and underwriting performance of U.S. health insurers at the state level between 2002 and 2010. We find that the average number of insurers operating in the states has generally increased, and, in the more recent years, the degree of market concentration has declined. We also find that the cost of health insurance, as proxied by direct premiums per enrollee, has increased. However, a closer look at the losses per enrollee reveals that such increases in health insurance premiums are accompanied by a corresponding increase in losses per enrollee, which is found to be highly correlated with the increase in premiums per enrollee. This suggests that the substantial increase in the cost of health insurance claims may be a significant driver of increasing health insurance costs.

In our multivariate analysis, we find evidence that market concentration and insurers' underwriting profits are positively related. More specifically, insurers in states with greater market concentration are more profitable than insurers in states with lower levels of market concentration. As noted in Bajtelsmit and Bouzouita (1998), this positive relation between concentration and profitability may be due to a number of factors—including price collusion, differences in products or efficiency—and it is, therefore, not clear if this relation is evidence in support of the SCP or efficiency structure hypotheses. As an attempt to provide some additional insight into the potential cause of the variation in profitability across the health insurance markets, we include a control variable for efficiency in the model and find some evidence that efficient operations of firms may explain some portion of the profit-concentration relation. However, due to data limitations and the absence of evidence in prior health insurance studies, we are unable to definitively determine whether comparative advantages in efficiency result in a positive relation between concentration and profits in health insurance markets. While our evidence of a positive profit-concentration in health insurance markets is a novel contribution to the literature, future research is clearly warranted, especially as it relates to the SCP hypothesis, the efficiency hypothesis or other factors that might further explain the relation between market concentration and insurer profitability in the health insurance industry.

Our results are relevant to the current and ongoing discussion of health care reform in the U.S. Our finding that increasing health insurance costs are associated with increasing health insurance claims suggests that the nature and extent of benefits utilization and other factors influencing claims costs should be a major consideration for policymakers going forward. For example, exploring what factors drive such substantial increases in health insurance claims and, more important, finding incentives and/or mechanisms to control such increases in claims may help to make health insurance more affordable. In addition, evaluating/re-evaluating regulations surrounding health insurance policy provisions to improve more efficient benefits utilization may aid in reducing the costs of health insurance.

As noted earlier, a number of the provisions of PPACA, such as coverage of preventive services and essential health benefits, in addition to the elimination of pre-existing condition provisions and lifetime limits, can increase the coverage provided to individuals. These provisions, at least in the short run, may cause claims costs to increase. Some early research on the impact of PPACA has found some evidence suggesting this may be the case. More specifically, McCue, Hall and Liu (2013) examine the medical loss ratios (MLRs) and expense ratios of insurers providing comprehensive health insurance in 2010 and 2011, and find that insurers experienced increased MLRs and lower administrative expense ratios. The same study also finds that insurers' operating margins fell by 1.3 percentage points. If this decrease in underwriting performance is representative of the experiences of insurers market-wide, this could ultimately influence the nature of competition in the health insurance market or impact health insurer efficiency. If this were to occur, our results suggest that the profitability of insurers would be impacted by such measures.

Historically, health insurance markets were primarily regulated by the states. Because state-based regulation can provide regulators the opportunity to respond to issues facing local insurance markets more quickly than federal regulation, state-based regulation may have an advantage over federal regulation in affecting competition and profitability in the health insurance marketplace in some states. With the passage of PPACA, concerns have been raised with regard to what impact this federal health insurance reform will have on health insurance markets. Proponents of federal regulation argue that uniformity in laws and regulations improves insurer efficiency and decreases other costs incurred by insurers resulting from duplicative regulation. To the extent that health insurers with large market shares could leverage these improvements in efficiency and reductions in costs to increase market share, federal regulation may increase concentration and profitability in health insurance markets. Alternatively, if the effects of efficiency and costs are leveraged by insurers with small market shares, then federal regulation could decrease market concentration and reduce insurer profitability in the marketplace. While McCue, Hall and Liu (2013) provides some early evidence of the impact of federal regulatory reform on health insurers, the effect of PPACA may not be known for some time because its provisions are set to go into effect over several years. As such, another fruitful area of future research appears to be the extent to which federal regulatory measures, such as PPACA, impact the health insurance marketplace.

Our analysis also highlights the need for future research pertaining to government health insurance programs' influence on competition and profitability in the health insurance market. More specifically, our data suggest that Medicare and Medicaid make up more than 20% of health insurance business for the average health insurer, yet the degree of participation in these programs does not significantly influence profitability. Because Medicaid expansion is one of the key provisions of PPACA, future research could consider the extent to which increased insurer participation in the Medicaid program influences market competition and concentration in health insurance markets. Similarly, as more members of the baby boomer generation reach retirement age, the number of people who collect Medicare will increase; future research could consider what impact this will have on the health insurance market.

Appendix A: Number of Insurers and Concentration by State

	No. of Insurers			Average Annual	Concentration			Average Annual
State	2002	2010	Average	□	2002	2010	Average	□
AK	3	12	8	27.99%	0.99	0.89	0.95	-1.36%
AL	9	17	11	13.85%	0.64	0.60	0.59	5.24%
AR	6	21	14	19.87%	0.63	0.45	0.60	-3.81%
AZ	18	33	25	8.71%	0.15	0.18	0.19	2.71%
CO	16	26	21	7.25%	0.16	0.24	0.20	4.93%
CT	10	20	14	9.65%	0.33	0.30	0.33	-1.10%
DE	13	19	15	6.02%	0.30	0.26	0.29	-0.76%
FL	25	39	33	6.69%	0.12	0.16	0.16	3.94%
GA	18	28	22	7.29%	0.45	0.22	0.38	-7.16%
HI	6	13	9	13.51%	0.76	0.34	0.47	-8.62%
IA	12	20	17	7.26%	0.29	0.70	0.54	17.42%
ID	6	20	14	18.28%	0.41	0.48	0.56	6.72%
IL	30	30	29	0.41%	0.26	0.52	0.41	14.08%
IN	22	29	26	4.46%	0.14	0.44	0.27	19.17%
KS	19	22	20	2.70%	0.17	0.24	0.17	6.23%
KY	19	24	21	3.40%	0.24	0.35	0.30	5.14%
LA	11	21	15	8.89%	0.30	0.32	0.34	2.67%
MA	14	28	20	9.35%	0.26	0.24	0.29	-0.88%
MD	23	26	23	2.16%	0.26	0.34	0.31	3.63%
ME	6	15	11	18.50%	0.60	0.56	0.60	-0.83%
MI	37	37	35	0.41%	0.26	0.28	0.30	13.43%
MN	9	18	14	10.56%	0.40	0.30	0.35	-3.49%
MO	27	32	29	2.46%	0.17	0.19	0.16	1.99%
MS	5	18	10	20.38%	0.72	0.63	0.55	38.10%
MT	4	17	10	22.94%	0.84	0.47	0.67	-6.92%
NC	13	23	16	9.24%	0.43	0.58	0.53	3.77%
ND	6	18	11	18.14%	0.90	0.86	0.89	-0.42%
NE	9	16	13	8.37%	0.53	0.61	0.59	1.80%
NH	4	17	10	24.02%	0.56	0.45	0.52	-2.69%
NJ	28	36	32	4.09%	0.27	0.37	0.31	4.14%
NM	9	21	15	12.98%	0.31	0.19	0.27	-4.83%
NV	13	23	17	8.59%	0.28	0.35	0.38	11.73%
NY	29	37	32	3.42%	0.10	0.15	0.14	5.07%
OH	29	34	31	2.43%	0.15	0.16	0.16	1.56%
OK	9	21	15	12.97%	0.38	0.39	0.35	0.91%
OR	17	31	25	8.68%	0.22	0.18	0.19	-2.29%
PA	29	31	28	1.14%	0.22	0.20	0.21	-1.13%
RI	7	16	10	13.62%	0.54	0.44	0.49	0.69%
SC	9	27	18	16.22%	0.27	0.33	0.48	8.01%
SD	6	18	13	15.85%	0.27	0.44	0.39	7.77%
TN	11	23	15	12.55%	0.18	0.30	0.35	12.26%
TX	39	50	43	3.42%	0.10	0.17	0.14	12.36%
UT	12	23	18	9.13%	0.30	0.27	0.32	-1.11%
VA	23	33	24	5.49%	0.12	0.30	0.27	19.52%
VT	5	14	8	17.83%	0.39	0.35	0.40	-1.17%
WA	18	29	24	6.60%	0.20	0.18	0.18	-1.22%
WI	24	47	35	8.95%	0.13	0.08	0.10	-5.16%
WV	8	21	16	14.93%	0.37	0.37	0.34	0.40%
WY	4	15	10	21.84%	0.66	0.65	0.70	1.02%

Note: "No. of Insurers" is defined as number of insurers with some direct premiums written in state *i* during year *t*; HHI of state *j* calculated as the sum of the squares of insurer *i*'s market share (measured as direct premiums written in state *j* during year *t*.

Appendix B: Price and Claims Costs by State

State	DPW per ENROLLEE 2002	2010	Average	Average Annual □	LOSSES per ENROLLEE 2002	2010	Average	Average Annual □
AK	2341.67	3793.22	2982.55	6.27%	1940.35	3243.07	2592.86	6.74%
AL	1731.16	2619.27	2209.36	6.68%	1526.57	2251.52	1946.87	5.71%
AR	1784.87	2542.21	2136.13	5.14%	1328.37	2010.06	1706.57	6.06%
AZ	1306.48	1746.74	1746.41	4.14%	1050.59	1491.39	1452.94	4.93%
CO	1272.52	1532.89	1272.95	3.13%	1105.41	1328.00	1086.82	2.95%
CT	1952.40	3585.62	3080.77	9.00%	1645.19	2974.21	2584.95	8.89%
DE	1690.82	962.70	1448.49	-3.49%	1426.05	793.74	1249.72	-3.53%
FL	2334.47	2962.33	2862.30	3.74%	2003.49	2439.63	2362.81	3.09%
GA	2067.20	2484.56	2301.58	3.43%	1768.93	2123.79	1983.50	3.50%
HI	1943.63	3610.32	2763.15	8.23%	1789.50	3344.50	2623.32	8.32%
IA	498.45	1934.30	1514.30	30.79%	430.60	1635.34	1301.08	31.73%
ID	92.82	2052.37	1497.83	103.21%	84.73	1743.49	1251.34	94.60%
IL	518.61	1947.22	1523.47	23.68%	436.28	1604.33	1269.04	23.06%
IN	737.05	1660.94	1321.40	11.65%	659.71	1399.23	1136.12	10.70%
KS	1051.35	1499.47	1459.48	5.07%	915.66	1207.58	1184.79	3.87%
KY	1932.52	1784.87	1971.42	-0.82%	1620.01	1497.23	1660.37	-0.77%
LA	2290.05	3578.45	2922.97	6.13%	1914.32	2969.13	2430.27	6.05%
MA	2201.10	3860.29	3287.53	8.74%	1928.29	3456.19	2903.26	9.03%
MD	1643.40	2711.03	2041.61	6.57%	1403.08	2218.71	1714.15	5.98%
ME	2973.72	3533.33	3327.04	2.34%	2427.91	3045.20	2798.73	2.95%
MI	1481.18	2825.20	2098.94	8.55%	1285.05	2468.08	1832.11	8.69%
MN	2044.73	2842.44	2237.52	4.63%	1758.96	2422.04	1945.73	4.57%
MO	1800.25	1652.62	1780.48	-0.69%	1494.30	1348.28	1490.26	-0.93%
MS	488.06	2439.37	1287.64	39.83%	377.68	2093.69	1083.25	47.49%
MT	1332.85	2604.68	1879.92	9.09%	1052.79	2222.40	1557.33	10.01%
NC	1729.89	2664.23	2234.33	5.63%	1428.26	2248.38	1813.55	5.90%
ND	1342.82	2294.84	1516.06	8.55%	1168.60	2102.61	1365.98	9.48%
NE	1114.53	2734.23	2246.44	13.63%	903.70	2257.45	1922.94	14.25%
NH	2741.79	3468.43	3452.01	3.47%	2219.75	3007.76	2928.71	4.44%
NJ	1970.23	1816.84	1737.71	-0.33%	1557.80	1542.29	1453.89	0.63%
NM	2133.99	3684.85	2737.58	8.41%	1803.66	3095.42	2320.24	8.44%
NV	1726.63	2450.45	2096.83	5.91%	1418.38	1986.90	1702.88	5.69%
NY	1503.10	3247.35	2348.41	10.17%	1295.33	2796.41	2021.24	10.15%
OH	1324.71	2249.36	1799.56	7.21%	1132.13	1850.52	1521.15	6.80%
OK	911.93	2254.37	2015.38	14.32%	785.38	1841.96	1686.39	13.36%
OR	1425.41	3525.69	2357.27	12.22%	1198.01	3102.36	2077.81	12.88%
PA	1495.05	2957.64	2302.12	9.18%	1300.97	2542.75	1993.62	9.02%
RI	1511.46	2496.76	2079.55	6.85%	1291.14	2178.87	1780.38	7.16%
SC	917.39	2107.01	1549.57	12.08%	822.62	1812.24	1290.74	11.71%
SD	812.97	1670.27	1288.17	12.73%	729.41	1455.57	1137.96	12.68%
TN	1238.36	3107.35	2248.32	12.69%	1030.28	2539.76	1860.90	12.45%
TX	1308.98	1985.50	1653.34	6.00%	1166.93	1644.56	1370.71	5.04%
UT	1638.12	2612.97	2060.16	6.17%	1400.30	2243.46	1770.89	6.36%
VA	1449.21	2688.22	2168.07	8.26%	1238.67	2201.48	1786.86	7.63%
VT	1143.79	2474.32	2055.72	12.12%	950.70	2120.49	1779.33	12.37%
WA	1634.76	2456.62	2043.09	5.48%	1462.38	2090.77	1784.41	4.86%
WI	1046.32	3144.12	2185.16	15.50%	932.51	2804.41	1940.85	15.55%
WV	2104.65	2645.18	2569.12	3.34%	1829.07	2223.88	2175.19	3.00%
WY	1997.21	3798.68	2871.80	8.87%	1684.67	3290.90	2479.46	8.93%

Note: "DPW per ENROLLEE" is the total direct premiums written in state *j* divided by the total enrollees insured in state *j*; "LOSSES per ENROLLEE" is the total losses in state *j* divided by the total enrollees insured in state *j*.

Appendix C: Loss Ratios by State

State	2002	2010	Average	Average Annual □	Min	Max	Median
AK	0.8286	0.8550	0.8688	0.34%	0.8286	0.9071	0.8662
AL	0.8818	0.8596	0.8822	-0.47%	0.8177	0.9134	0.8875
AR	0.7442	0.7907	0.7959	0.71%	0.7442	0.8397	0.7907
AZ	0.8041	0.8538	0.8306	0.74%	0.8041	0.8538	0.8294
CO	0.8687	0.8663	0.8542	-0.07%	0.8325	0.8728	0.8597
CT	0.8427	0.8295	0.8387	-0.24%	0.8103	0.8785	0.8394
DE	0.8434	0.8245	0.8569	-0.45%	0.8236	0.9494	0.8434
FL	0.8582	0.8236	0.8267	-0.55%	0.8041	0.8582	0.8295
GA	0.8557	0.8548	0.8621	-0.04%	0.8366	0.8957	0.8557
HI	0.9207	0.9264	0.9491	0.04%	0.9207	0.9756	0.9538
IA	0.8639	0.8454	0.8587	-0.32%	0.8315	0.8867	0.8611
ID	0.9129	0.8495	0.8488	-0.96%	0.8129	0.9129	0.8433
IL	0.8412	0.8239	0.8342	-0.28%	0.8110	0.8585	0.8399
IN	0.8951	0.8424	0.8654	-0.79%	0.8360	0.8964	0.8482
KS	0.8709	0.8053	0.8132	-1.06%	0.7801	0.8709	0.8116
KY	0.8383	0.8388	0.8421	-0.03%	0.8142	0.8798	0.8388
LA	0.8359	0.8297	0.8313	-0.10%	0.8189	0.8418	0.8311
MA	0.8761	0.8953	0.8808	0.26%	0.8600	0.9153	0.8761
MD	0.8538	0.8184	0.8404	-0.55%	0.8184	0.8582	0.8448
ME	0.8165	0.8619	0.8402	0.63%	0.7854	0.8778	0.8493
MI	0.8676	0.8736	0.8705	0.07%	0.8503	0.8975	0.8676
MN	0.8602	0.8521	0.8694	-0.13%	0.8521	0.8940	0.8667
MO	0.8301	0.8158	0.8370	-0.25%	0.8158	0.8716	0.8358
MS	0.7738	0.8583	0.7919	0.98%	0.6546	0.8944	0.7738
MT	0.7899	0.8532	nsurer	0.92%	0.7899	0.8535	0.8311
NC	0.8256	0.8439	0.8098	0.21%	0.7690	0.8510	0.7965
ND	0.8703	0.9162	0.8989	0.59%	0.8660	0.9289	0.9051
NE	0.8108	0.8256	0.8532	0.20%	0.8108	0.8858	0.8578
NH	0.8096	0.8672	0.8463	0.82%	0.8096	0.8879	0.8510
NJ	0.7907	0.8489	0.8373	0.85%	0.7907	0.8803	0.8437
NM	0.8452	0.8400	0.8473	-0.08%	0.8400	0.8566	0.8462
NV	0.8215	0.8108	0.8118	-0.19%	0.7923	0.8445	0.8108
NY	0.8618	0.8611	0.8592	-0.02%	0.8427	0.8766	0.8611
OH	0.8546	0.8227	0.8456	-0.49%	0.8227	0.8585	0.8472
OK	0.8612	0.8171	0.8398	-0.68%	0.8171	0.8636	0.8376
OR	0.8405	0.8799	0.8775	0.56%	0.8405	0.8986	0.8799
PA	0.8702	0.8597	0.8656	-0.16%	0.8470	0.8850	0.8674
RI	0.8542	0.8727	0.8556	0.26%	0.8386	0.8727	0.8542
SC	0.8967	0.8601	0.8313	-0.63%	0.7908	0.8967	0.8357
SD	0.8972	0.8715	0.8826	-0.49%	0.8200	0.9239	0.8972
TN	0.8320	0.8173	0.8276	-0.24%	0.8068	0.8550	0.8301
TX	0.8915	0.8283	0.8309	-0.96%	0.8134	0.8915	0.8278
UT	0.8548	0.8586	0.8601	-0.04%	0.8380	0.8999	0.8548
VA	0.8547	0.8189	0.8257	-0.55%	0.7971	0.8547	0.8243
VT	0.8312	0.8570	0.8627	0.31%	0.8312	0.9280	0.8570
WA	0.8946	0.8511	0.8748	-0.64%	0.8511	0.8946	0.8758
WI	0.8912	0.8920	0.8864	0.00%	0.8687	0.8981	0.8912
WV	0.8691	0.8407	0.8478	-0.47%	0.8095	0.8691	0.8530
WY	0.8435	0.8663	0.8666	-0.10%	0.8099	0.9878	0.8557

Note: The loss ratio is the tota losses incurred in state *j* divided by direct premiums written in state *j*.

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