

The Affordable Care Act and Medical Malpractice Liability

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Abstract

This paper studies the impact of the Affordable Care Act (ACA) on the medical malpractice liability. The ACA introduced millions of new insureds to the healthcare system while the physician supply is roughly unchanged. The sudden increase in the demand for healthcare service might increase the exposure for physicians to higher malpractice liability risk. In this paper, we find that the ACA-driven abnormal health insurance coverage significantly increases medical malpractice claim losses, but the impact is significant only in states with Medicaid expansion. Medical malpractice premiums are not affected significantly overall but states with Medicaid expansion experience some premium increases. Results using a Generalized Synthetic Control approach show that unobservable common trends such as the underwriting cycle cannot explain the results.

Key Words: Affordable Care Act, Medical Malpractice Insurance Liability

1. Introduction

The Patient Protection and Affordable Care Act (ACA) was signed into law in 2010 and became fully effective in 2014. The ACA have numerous elements, including Medicaid Expansion, the introduction of Insurance Exchanges, and the Individual Mandate. Those changes decreased the uninsured rate from around 16.8% in 2013 to 10.2% in 2017 (Kaiser Family Foundation, 2018)

After the ACA was introduced, health insurance coverage has been expected to expand to over 30 million Americans. The addition of millions of new insureds to the healthcare system in a couple of years may have profound effects on physicians, who work in the frontline of the healthcare system and the insurance industry, who funds healthcare services. A considerable amount of research has investigated the impacts of the ACA on insurance coverage, healthcare costs, access to care, and the quality of care (Miller and Wherry, 2017; Sommers, Blendon, and Orav, 2016; Decker and Sommer, 2017). However, an important but relatively unexplored issue is whether the expanding access to healthcare increases the medical malpractice liability risk.

This paper fills this gap by investigating the impact of the ACA implementation on medical malpractice liability accounting for the variation in state tort systems. This is an important question because medical errors are the third most important causes of death just behind heart disease and cancer in the United States (Makary and Daniel, 2016). Although the ACA does not have substantive provisions related to medical malpractice, it may change the physician-patient relationship. Recent literature shows that the Medicaid expansion improves the access to healthcare as well as utilization of medications and services (Kaiser Family Foundation, 2015; Miller and Wherry, 2017; Mazurenko, 2018). This increases patient-physician interactions and thus the volume of overall medical errors. Also, U.S. adults who receive their healthcare coverage through Medicaid are in worse health conditions than those with other forms of health insurance (Gallup, 2017). A large volume of new Medicaid patients due to the implementation of the ACA

might increase the complexity of treatments, which may expose physicians to higher medical malpractice risk. Moreover, while the demand for healthcare service increases steeply, physician supply grows slowly. The Association of American Medical Colleges (AAMC) projects that there is an appreciable physician (AAMC, 2015). The imbalance between physician demand and supply is likely to place pressure on healthcare providers and increase the medical malpractice risk no matter whether new or old patients are treated.

[Insert Figure 1 here]

In this paper, we study whether the ACA increases medical malpractice liability by analyzing the data from the medical malpractice insurance industry. As a professional liability insurance, medical malpractice insurance provides coverage to medical practitioners for liability arising from medical services that result in a patient's injury or death. Since carrying medical malpractice insurance is almost a requirement for physicians by law in most states, if the ACA increases medical malpractice liability, the medical malpractice insurance industry is expected to experience higher losses. Our goal is to explore one type of the potential social cost of the ACA to the states. We use state-aggregated total losses incurred in the state medical malpractice insurance market. We further analyze the premiums and loss ratios of the state medical malpractice insurance market. In this way, we could investigate whether insurers charge higher premiums to transfer the ACA-driven medical malpractice claim costs to customers and whether the premiums they charge are enough to cover the claim costs.

Among new provisions of the ACA, two affect health insurance coverage are the Medicaid expansion and health insurance exchanges. In particular, for states with Medicaid expansion households with income up to 138% of Federal Poverty Level (FPL) are eligible for Medicaid, while this threshold is 44% on average before the ACA. Under this provision, more low-income households qualify for free or low-cost health care. Although under the ACA the eligibility level

for Medicaid is the same for each state, its impact varies across states. Those states with lower pre-ACA Medicaid eligibility level and with larger low-income population should be affected more by Medicaid expansion than other states. For those who are neither qualified for Medicaid nor covered by other public or private insurance, they can purchase health insurance from the ACA health insurance marketplace/exchange market and receive subsidies if their income is lower than 400% of FPL. Further, since insureds are more likely to visit physicians, the increasing insured population enrolled through these two ACA programs increase the demand for healthcare service, exposing medical practitioners to higher medical malpractice risk.

To measure the increasing demand for healthcare due to the ACA, we focus on four variables: (1) total enrollment in Medicaid; (2) total enrollment in the exchange market; (3) total enrollment in Medicaid and the exchange market, and (4) the percent change of total enrollment in Medicaid before and after Medicaid expansion.

As a preview of the results in this paper, we find that economic loss ratio and economic losses incurred increase with the ACA-driven demand for healthcare. The larger a population obtains health insurance through the ACA, the higher medical malpractice liability costs in the states. Nevertheless, the results are significant only for states with Medicaid expansion. The medical malpractice losses in the states without Medicaid expansion are not influenced significantly. We also find that medical malpractice premiums do not change overall but states with Medicaid expansion experience an increase in premiums. Using the general synthetic control (GSC) approach with interactive fixed effects model introduced by Xu (2017), we show that the ACA implementation, rather than other unobservable trends in the medical malpractice insurance market, is the reason for these changes.

In addition to the main research question, we also investigate whether tort reforms shield states from the side impact of Medicaid expansion on medical malpractice liability. While the ACA

is expected to increase medical malpractice claim costs to insurers, tort reforms, which starts in the mid-1970s, aim to limit the probability of paying a malpractice claim or censor the right tail of the award distribution (Lieber, 2014) by setting a cap for the award. A strand of studies (see, e.g., Born, Viscusi, and Baker, 2009; Paik et al., 2012) shows that tort reforms, especially caps on noneconomic damages, have reduced medical malpractice losses considerably. Results in our paper show that, tort reforms do not offset the side impact of the ACA on the medical malpractice insurance industry.

This paper contributes to the extant literature in a few ways. This paper is among the first to investigate the impact of the ACA, especially Medicaid Expansion and healthcare exchange markets, on the medical malpractice insurance market. We study this issue by considering the variation in legal and economic environments across states. We also separate the impact of the ACA from other unobservable market trends using the generalized synthetic control method. The rest of this paper proceeds as follows. In Section 2, we review recent literature on both health care reforms and tort reforms. In Section 3, we introduce the empirical model and present the empirical results. Conclusion remarks are given in Section 4.

2. Literature Review

This paper is closely related to two strands of literature. The first stream of literature discusses impacts of the recent healthcare reform on the healthcare system. The second strand of literature evaluates impacts of tort reforms on the medical malpractice liability.

The ACA, as the most important regulatory overhaul in the U.S. healthcare system since the passage of Medicare and Medicaid in 1965, has profound implications on society, politics and the economy. Recent studies have shown that Medicaid expansion states have seen a significant increase in Medicaid enrollment and large reductions in uninsured rates in contrast to non-expanded states (Miller and Wherry, 2017; Decker, Lipton, and Sommers, 2017; American

Medical Association,2017). Further evidence shows that access to health care was improved and medical services utilization, such as diagnose and care of chronic conditions, increased (Sommers et al., 2017; Sommers, Blendon, and Orav, 2016; Nasseh and Vujicic, 2016)

While the ACA increases the demand for a wide range of medical services steeply (Hofer et al., 2011; AAMC, 2015), the supply of physicians is expected to grow much slower, leading to a total physician shortfall (AAMC, 2015). This shortfall for health care may place significant pressure on physicians and hospitals. For instance, Holzmacher et al. (2017) study over 2,000 patients from Washington D.C, Maryland, and Virginia, three states with different levels of Medicaid expansion. They find that expansion of Medicaid eligibility is associated with a significant reduction in the length of stay after injury. Miller and Wherry (2017) compare medical outcomes before and after Medicaid expansion using data from National Health Interview Survey. They find that expansion results in a significant increase in the reported delayed medical care due to no available appointment time or long waiting time.

To the best of my knowledge, little research has been conducted regarding the effect of the ACA on medical malpractice except for RAND (2014). Using a micro-simulation model, RAND (2014) projects that the implementation of the ACA would increase medical malpractice claim losses by 3.4% on average in 2016 with \$160 million in 2016 U.S. dollar. Also, the ACA impact is heterogenous across states. The claim losses are predicted to increase by only 0.4% in Wisconsin but 7.8% in New Mexico. Although RAND (2014) provides its estimation of the ACA effects on medical malpractice claim costs, it is a prognosis based on simulated data with scant empirical evidence. To this end, we aim to provide the first empirical evidence on how the implementation of the ACA affects medical malpractice liability.

Another strand of literature related to this paper is about tort reforms. Since 1980s, most states in the U.S. have enacted a series of tort reforms as a response to growing frequency and

severity of court awards, increasing legal expenses, and decreasing liability insurance affordability. The focus of tort reforms is the medical malpractice insurance industry (Born, 2009, 2017). Under this background, a considerable amount of literature has investigated the influence of tort reforms on medical malpractice insurance claim losses and malpractice insurers' profitability. The main finding is that tort reforms, especially caps on noneconomic damages, reduce medical malpractice awards and thus cut losses incurred by malpractice insurers (Danzon, 1986; Viscusi and Born, 1993, 2005; Barker, 1992; Born and Viscusi, 1998; Born, Viscusi, and Baker, 2009; Grace and Leverty, 2012). In this paper, we study the ACA's effect on medical malpractice claim losses by taking into account the impact of tort reforms.

3. Empirical Analysis

3.1. Empirical Hypotheses

As mentioned earlier, the U.S. has experienced a steep increase in insured population in a couple of years after the legislation of the ACA came into effect. This sudden increase in the demand for healthcare service will possibly cause more medical malpractice claims losses. Also, because the ACA does not have any provision directly related to the medical malpractice industry, the implementation of the ACA is an exogenous event and thus can be used as a natural experiment to study whether expanding access to health care changes the medical malpractice liability costs. In addition to losses, we also investigate whether insurers, expecting an increase in medical malpractice claims, would increase the premiums accordingly in order to maintain their profitability. This argument leads to our following hypotheses.

Hypothesis 1: The higher enrollment in Medicaid and healthcare marketplace in a state, the higher total medical malpractice losses (loss ratio) that state will experience.

Hypothesis 2: The higher enrollment in Medicaid and healthcare marketplace in a state, the higher total medical malpractice premiums that state will have.

Among the elements of the ACA, the one which has expanded health insurance access most

is the Medicaid expansion. However, by the end of 2016, only 32 states had expanded Medicaid while 19 states had not. For states without Medicaid expansion, the ACA's impact on health insurance coverage is only through the health insurance marketplace, which has a low enrollment volume compared with Medicaid. For this reason, we expect that the ACA's impact on medical malpractice insurance losses are much stronger in states with Medicaid expansion in contrast to those without the Medicaid expansion. This leads to our Hypothesis 3 as follows.

Hypothesis 3: States with Medicaid expansion experience a significant increase in medical malpractice losses and loss ratio, while states without Medicaid expansion are not affected significantly.

3.2. Data

To study the impact of Medicaid expansion and its joint impact with tort reforms on the medical malpractice insurance industry, we use aggregated state-level data of Medicaid enrollment, the medical malpractice losses, and insurance premiums.

Three major dependent variables: economic incurred losses (per capita), economic loss ratio, and earned premiums per capita are used to measure the medical malpractice claim costs and insurance premiums earned by insurers. Reported incurred losses and earned premiums are from the SNL database, which collects the data from National Association of Insurance Commissioner (NAIC). We follow prior literature (i.e., Cummins, 2000; Grace and Leverty, 2012; Born et al., 2009) to calculate the present value of the reported losses incurred. Dividing economic losses incurred over premium earned is the economic loss ratio. To estimate the present value of losses incurred, we calculate the payout proportions for medical malpractice insurance by applying Taylor separation methods (Taylor, 2000) to the loss reserve data from the Schedule P of the NAIC database. This allows us to discount the estimated future medical malpractice insurance loss payments. The discount rate is obtained from the Federal Reserve Bank of St. Louis. The detailed estimation process can be referred to Taylor (2000). The present value of losses incurred is

regarded as the theoretically correct variable to measure liability insurance market because it accounts for the long-tailed nature of medical malpractice liability claims (Grace and Leverty, 2012; Born and Karl, 2016).

Regarding the data for tort reforms, we use the Database of State Tort Law Reforms (Avraham, 2014; DSTLR 5rd). This dataset tracks tort reforms from 1980 to 2013. We further extend the dataset to 2017 based on tort reform data from the American Tort Reform Association (ATRA, 2018). Grace and Leverty (2012) document that the expectation for future constitutionality of a reform is of importance to the impact of the reform. They find only permanent tort reforms have significant impact on malpractice insurers' losses. For this reason, this paper only considers permanent tort reforms. States with tort reforms declared unconstitutional are regarded as non-tort reform states. Data shows that the state tort system is quite stable after the ACA was implemented. Only two tort reforms related to medical malpractice losses are adopted since 2013. They are caps on punitive damages and collateral source reform. Punitive damages exist to punish a defendant for the intentional or malicious misconduct and to deter similar future misconduct (ATRA, 2017). Because the frequency and size of punitive damages awards grow greatly and punitive damages are asked routinely in civil lawsuits, 32 states enacted reforms by adding caps on punitive damages allowed. For the collateral source reform, it focuses on the cases that plaintiffs may receive compensation from a variety of source such as workers compensation or health insurance, other than liability insurance. If the plaintiff has been compensated by other sources, the proceeds paid by medical malpractice insurers would be reduced. This reform prohibits a patient from suing for damages that were paid (ATRA, 2016) and from over indemnification.

Several state-level demographic variables are collected mainly from the Bureau of Economic Analysis (BEA). The detail of these variables and empirical analysis will be introduced in the next section.

[Insert Table 1 and Table 2 here]

3.3. Empirical Results

To test the impact of the ACA on Medical malpractice, we use the following linear regression model,

$$Y_{it} = \beta_0 + \beta_1 ACA_{it} + \alpha \times X_{it} + \lambda_t + \delta_i + \varepsilon_{it}, \quad (1)$$

where i refers to state i and t refers to year t .

Y_{it} is a vector of the dependent variable. In this paper, it is the medical malpractice economic losses incurred (loss ratio) or premium.

ACA_{it} measures the abnormal demand for healthcare due to the implementation of the ACA;

X_{it} is a set of control variables;

λ_t is the vector for time fixed effect;

δ_i is the vector for state fixed effect;

ε_{it} are idiosyncratic errors;

We use four variables to measure the demand for healthcare after the ACA. They include the total population enrolled in the Medicaid program, the total population enrolled in the insurance exchange market, the total population enrolled in both the exchange market and Medicaid. These three variables are all at state level and are scaled by the state population. Moreover, to further capture the abnormal demand for healthcare caused by the ACA, the percentage change in total post-ACA Medicaid and CHIP enrollment, from the pre-ACA average monthly Medicaid and CHIP Enrollments is used. Briefly, Medicaid.gov updates the total number of people enrolled in the Medicaid program each month so that we could estimate the monthly average population enrolled in the program in 2013. This enrollment variable is a point-in-time count of total program enrollment rather than a count of only newly enrolled during the reporting period. The percent

change is defined as the ratio of year-end population enrolled in the Medicaid program in years after 2013 over the monthly average total population enrollment in the Medicaid program in 2013 (Kaiser Family Foundation, 2018) minus 1. To clarify, the monthly average total enrollment in 2013 considers all normal variations in the enrollment and termination. If there is no policy change, the Medicaid enrollment in a short period after 2013 should be close to the previous year average enrollment. If there is a large increase in the enrollment after 2013, we could regard it as the influence of the policy change, which is the ACA Medicaid expansion.

The control variables that we use in this paper include the number of lawyers, employment in the insurance industry, employment of medical practitioners, contribution of the insurance industry to GDP, and GDP per capita. For tort reform variables, a dummy variable is constructed, which is equal to 1 in year t if the state enacted a tort reform in or before year t , and 0 otherwise. The definitions of these variables are provided in the appendix.

Tables 3-5 present empirical results using the full sample about how the ACA affects premiums, economic losses incurred, and economic loss ratio. For each table, we report regression results using one of the four variables that measure the healthcare demand separately. We also consider three different sets of control variables to show the consistency of the results. The first set includes economic control variables but does not include year dummies or tort reform variables. The second set adds year dummies to the first set of variables. The third set includes economic variables, year dummies, and tort reform variables. Since states barely change their tort systems after 2014, tort reforms variables, except caps on punitive damage and collateral source reform, are omitted due to multicollinearity with state fixed effects. In other words, state fixed effects controls for the impact of tort reforms which don't have any change after 2013.

Regarding the impact of the ACA on premiums, the results in Table 3 show that the enrollment in the Medicaid and/or exchange markets does not change premiums significantly in

all specifications. Regarding the impact of the ACA on losses incurred (log), the results in Table 4 show that economic losses incurred significantly increase with three variables, the enrollment in Medicaid, percent change in the Medicaid enrollment, the total enrollment in Medicaid and exchange markets. The variable, enrollment in the exchange market itself is not significant, mainly because it contributes to only a small part of new insurance enrollment.

Regarding the impact of the ACA on loss ratios, the results presented in Table 5 are comparable to the results of losses incurred. Three variables, the enrollment in Medicaid, percent change in Medicaid enrollment, and the enrollment in Medicaid and exchange markets, have significant positive impacts on medical malpractice losses ratios. Taken together, we find evidence to support Hypothesis 1 but not Hypothesis 2. Medical malpractice claim losses increase significantly with the unusual demand for healthcare while medical malpractice insurance premiums are relatively stable.

Regarding tort reform variables, states implement only caps on punitive damages and collateral source reform after 2013. For states that implemented caps on punitive damages after 2013, they experience lower medical malpractice insurance premiums as well as lower losses. In contrast, for states implementing the collateral source reform, premiums are not impacted while losses are even higher than those in states without a collateral source reform. For other economic variables, the number of lawyers is positively related to medical malpractice losses incurred while the number of hospital employees and social workers are positively related to medical malpractice premiums. Other variables do not have significant coefficients.

We further test Hypothesis 3, i.e., the ACA affects states with Medicaid expansion significantly but has little impact on states without Medicaid expansion. Table 6.1 presents the univariate analysis of loss ratio in the Medicaid expansion and non-Medicaid expansion states. The results show that states with Medicaid expansion have significantly higher loss ratio than

states without Medicaid expansion. In Table 6.2, we list states with economic loss ratio higher than 100% and 80%, respectively. The table documents that all states on the list are states which have adopted Medicaid expansion.

The raw evidence shows that medical malpractice insurers in the Medicaid expansion states experience much higher losses than those in non-expansion states. To further test that hypothesis, we do subsample analysis for the sample with/without Medicaid expansion using the same regression model used for the full sample. Table 7 to Table 9 presents the results on premiums, losses incurred and losses ratio.

Table 7 presents the subsample results when premiums earned is used as the dependent variable. We find that, in the states with Medicaid expansion, the percent change in Medicaid enrollment before and after the ACA (and the total enrollment in the exchange and Medicaid) has a positive effect on premiums earned when we control for year fixed effects and/or add tort reform variables. These results are significant at the 10% level. However, in the subsample of states without Medicaid expansion, we do not see any significant result. These split-sample results provide some evidence that insurers increase premiums in states with Medicaid expansion as a response to high medical malpractice liability caused by Medicaid expansion.

Table 8 and 9 present the subsample results when losses incurred or loss ratio is used as the dependent variable, respectively. Consistent with previous findings, we show that enrollment in Medicaid or the exchange market or both and the percentage change in Medicaid enrollment before and after the ACA significantly increase losses incurred and loss ratio in the Medicaid expansion states. However, none of these variables is significant in the subsample analysis for states without Medicaid expansion. Therefore, Hypothesis 3 is supported by empirical evidence obtained from subsample analysis as well.

Taken together, we find that two ACA elements, i.e., Medicaid expansion and the exchange

market, significantly increase losses incurred and loss ratio in the medical malpractice insurance industry in the U.S. Also, the influence is mostly driven by states with Medicaid expansion. Premium are not affected significantly but states with Medicaid expansion experience some increase in premiums.

3.4. Robustness Check

One concern of the results presented in the earlier subsection is that using subsample analysis does not compare the impact of Medicaid expansion on the treated group (states with expansion) with that on the control group (non-expansion states) directly. Also, some unobservable common trend might drive the results. To better explore the average impact of Medicaid expansion on medical malpractice liability in the treated group compared to the control group, we apply the generalized synthetic control (GSC) method with an interactive fixed effect model introduced by Xu (2017).

Normally difference-in-difference (DID) estimation in a panel setting is the most conventional method to study the average treatment effect of regional policies. It is, however, not appropriate for the goal of this paper because of two reasons. First, DID estimation relies on the parallel trend assumption. Under this assumption, in the absence of the ACA Medicaid expansion, the outcome variables in the expansion and non-expansion states would follow the same trend. However, the time of Medicaid expansion is coincident with other elements of the ACA such as health insurance exchange market. Non-expansion states adopt other relevant policies, such as different types of exchange markets, in the post- expansion period, making them an invalid control group if we want to test the pure effect of Medicaid expansion. In addition, Figures 2.1 to 2.2 illustrate the average premium per capita, economic loss ratio, and economic losses incurred of the medical malpractice insurers from 1986 to 2016. As shown by these figures, states expanding Medicaid have experienced higher premiums and losses than those without expansion in the whole

sample period. The gap between the two groups gets bigger beginning from 2005. Medicaid expansion might explain the increased gap after 2010, but the increased gap before 2010 is likely to be caused by other factors. In other words, in the pretreatment period, the parallel trend assumption might not hold, so we cannot use the DID method to explore the pure effect of the ACA by comparing expansion states and non-expansion states.

[Insert Figure 2.1 and 2.2 here]

Therefore, we employ the GSC approach in this paper. Briefly, in the GSC estimation, pretreatment data of the control and treated groups are used to estimate an interactive fixed effect model including the number of latent factors and factor loadings. The interactive fixed effect model is then used to make out-of-sample predictions for post-treatment counterfactual outcomes of the treated group. The gap between the estimated (counterfactual) and the actual post-treatment outcomes of the treated group is the average treatment effect of the policy on the treated group. The GSC model is a data-driven procedure which constructs a pseudo synthetic control group to minimize the pre-treatment differences in means between the treated group and the synthetic control group. So the parallel assumption is relaxed. In addition, the interactive fixed effect model in GSC captures the heterogeneous time trends using a factor structure in which time factors represent time-varying unobservable and factor loadings represent heterogeneous impacts of these factors on states (Bai, 2009; Xu, 2016). In other words, GSC not only relaxes the parallel trend assumption but also controls the heterogeneous impact of unobservable common trends in the medical malpractice insurance market.

The parameter of interest is the average effect of the treatment on the treated (ATT). Table 10 presents the results using the GSC approach. The results show that the \widehat{ATT} of Medicaid expansion on economic loss ratios is 12.5%. It indicates that Medicaid expansion has caused a 12.5% increase in economic loss ratio in contrast to the counterfactual where the treated group

were not treated. Economic losses incurred per capita has also increases by $10.27(e^{2.33})$ on average in the treated group. However, Medicaid expansion does not have a significant effect on medical malpractice insurance premiums per capita.

The GSC approach also estimates \widehat{ATT} for each post-treatment period. Specifically, the impact of Medicaid expansion on the economic loss ratio of expansion states starts to be significant from the second year after treatment and lasts until the fourth period. Only a couple of states including Alaska, Indiana, Louisiana, and Montana have post treatment periods longer than four years. For these states, the impact of Medicaid expansion decays in the long run. The impact on economic losses per capita starts to be significant from the second post-treatment year and lasts for a longer period. Although the average impact of Medicaid expansion on medical malpractice insurance premiums is insignificant, \widehat{ATT} on premiums in the first three years (including the treatment year) is positive and significant. This may indicate that insurers expect Medicaid expansion may increase the malpractice risk and, in response, insurers then charge a higher premium in the short run. Figure 3 visualizes the average treatment impact on the treated states. The premium gap between the treated group and the control group is negligible before Medicaid expansion, but became significant after the treatment year. In summary, the results from the GSC model are consistent with those from the earlier section. States with Medicaid expansion experience significantly higher medical malpractice claim losses (loss ratios) than states without Medicaid expansion.

[Insert Table 10 here]

[Insert Figure 3.1 and 3.2 here]

4. Conclusion

In this paper, I study the impact of the ACA implementation on the Medical malpractice liability by analyzing the data of Medical malpractice claim losses (loss ratios) and premiums at

the state level. The ACA expands health insurance to over 25 million Americans. As a consequence, we see a growth in the demand of healthcare service, exposing physicians to higher medical malpractice risk. In this paper, we find that the ACA significantly increases medical malpractice claim losses, but the impact is significant only in those states with Medicaid expansion. Medical malpractice premiums are not affected significantly overall, but states with Medicaid expansion experienced some increase in premiums. Results from the GSC approach show that unobservable common trends such as the underwriting cycle cannot explain these results. The long-run impact of the ACA is worth more investigation.

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Appendix

Table 1: Variable Definition

Variable	Definition	Data source
Premium Earned	State-aggregated premiums earned	NAIC
Losses Incurred	State-aggregated Losses incurred	NAIC
Loss Ratio	Losses Incurred/Premium Earned	NAIC
Medicaid Enrollment	Year-end Medicaid enrollment in that state	Kaiser Family Foundation
Medicaid and the exchange market Enrollment	Year-end total enrollment in Medicaid and the exchange market in that state	Kaiser Family Foundation
Exchange Market Enrollment	Year-end total enrollment in the exchange market in that state	Kaiser Family Foundation
Percent Change	The ratio of year-end population enrolled in the Medicaid program in years after 2013 over the monthly average total population enrollment in the Medicaid program in 2013.	Kaiser Family Foundation
Collateral Source Reform(CSR)	A dummy variable equal to 1 if a state has enacted CSR before year t, and 0 otherwise.	American Tort Reform Association
Caps on Punitive Damages Reform (CP)	A dummy variable equal to 1 if a state has enacted CP before year t, and 0 otherwise	
GSP per capita	Total gross state product (GSP) divided by the total state population.	Bureau of Economic Analysis http://www.bea.gov
Employment in the Insurance Industry per capita	Ratio of the total number of employment in the insurance industry in a state to the total population in the state	Bureau of Economic Analysis http://www.bea.gov
Employment in the Hospitals and Social Workers	Ratio of the total number of employment in the healthcare system in a state to the total population in the state	Bureau of Economic Analysis http://www.bea.gov
Lawyer per capita	Ratio of the total number of lawyers in the healthcare system in a state to the total population in the state	Bureau of Labor Statistics

Note: Table 1 presents definitions of all major dependent and independent variables.

Table 2: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Premium Earned	200	10.147	0.408	9.279	11.375
Economic Losses Incurred	194	9.077	0.911	5.153	10.759
Economic Loss Ratio	194	3.523	0.706	0.219	4.753
Percent Change	192	0.278	0.243	-0.096	1.098
Medicaid Enrollment	200	0.213	0.058	0.098	0.372
Medicaid and Exchange Market Enrollment	200	0.246	0.056	0.130	0.398
Number of Lawyer	200	0.003	0.001	0.002	0.009
Employment in the Hospitals and Social Workers	200	0.060	0.012	0.037	0.093
Employment in the Insurance Industry	200	0.008	0.003	0.003	0.017
Real GDP	200	51.489	9.794	33.270	76.225

Note: Table 2 presents summary statistics of all major dependent and independent variables from 2014 to 2017. Except for Economic Loss Ratio and Percent Change, all other variables are scaled by population.

Table 3 The Affordable Care Act and the Medical Malpractice Insurance Industry: Premium Earned

Dependent Variable: Log (Premium Earned)												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Medicaid Enrollment (Per Capita)	-0.143	0.268	0.287									
	(-0.28)	(0.70)	(0.75)									
Percent Change				-0.0488	0.0409	0.0407						
				(-0.52)	(0.61)	(0.61)						
Medicaid and Exchange Market Enrollment (Per Capita)							-0.371	0.395	0.404			
							(-0.86)	(1.17)	(1.19)			
Exchange Market Enrollment (Per Capita)										-1.510**	1.067	0.991
										(-2.15)	(1.16)	(1.06)
Number of Lawyer (Per Capita)	26.64	30.03	29.58	15.07	14.44	14.34	28.62*	29.09	28.76	25.35*	32.47*	32.19*
	(1.67)	(1.66)	(1.64)	(1.14)	(1.21)	(1.18)	(1.82)	(1.59)	(1.58)	(1.68)	(1.76)	(1.74)
Employment in the Hospital and Social workers	-14.92**	19.27**	18.68*	-14.61**	19.86**	19.27**	-12.76**	19.45**	18.85**	-10.96**	20.11**	19.53**
	(-2.58)	(2.15)	(2.00)	(-2.49)	(2.24)	(2.10)	(-2.05)	(2.21)	(2.06)	(-2.26)	(2.49)	(2.32)
Employment in the Insurance Industry	14.96	35.50	34.32	11.41	30.25	29.23	18.38	34.32	33.17	18.98	36.66	35.76
	(0.56)	(1.44)	(1.35)	(0.42)	(1.24)	(1.16)	(0.68)	(1.38)	(1.30)	(0.72)	(1.56)	(1.48)
Real GDP (Per Capita, 1000\$)	0.007	0.012**	0.012**	0.007	0.013**	0.013**	0.006	0.012**	0.012**	0.008	0.011*	0.011*
	(0.75)	(2.17)	(2.08)	(0.90)	(2.58)	(2.46)	(0.70)	(2.37)	(2.26)	(1.03)	(1.92)	(1.83)
Contribution of the Insurance Industry to GDP	-0.0189	-0.0153	-0.0156	-0.0233	-0.0138	-0.0142	-0.0201	-0.0142	-0.0145	-0.0211	-0.0138	-0.0143
	(-1.22)	(-0.73)	(-0.74)	(-1.48)	(-0.62)	(-0.63)	(-1.26)	(-0.71)	(-0.72)	(-1.21)	(-0.73)	(-0.74)
Caps on Punitive Damage			-0.076***			-0.070***			-0.075**			-0.069***
			(-5.28)			(-5.13)			(-5.47)			(-4.57)
Collateral Source Reform			0.000			0.004			0.002			0.000
			(0.00)			(0.21)			(0.10)			(0.02)
Constant	10.56***	8.052***	8.146***	10.53***	8.107***	8.200***	10.49***	7.991***	8.086***	10.26***	8.056***	8.151***
	(28.83)	(11.83)	(11.60)	(28.59)	(12.03)	(11.80)	(27.62)	(11.95)	(11.72)	(24.57)	(12.37)	(12.05)
Year Fixed Effect	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	200	200	200	192	192	192	200	200	200	200	200	200
adjusted R square	0.9738	0.978	0.978	0.9732	0.978	0.978	0.9740	0.978	0.978	0.9743	0.978	0.978

Table 4. The Affordable Care Act and the Medical Malpractice Insurance Industry: Economic Losses Incurred

Dependent Variable: Log Economic Loss Incurred.												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Medicaid Enrollment (Per Capita)	4.814** (2.03)	4.495* (1.78)	4.660* (1.82)									
Percent Change				0.878** (2.56)	0.864** (2.46)	0.886** (2.49)						
Medicaid and Exchange Market Enrollment (Per Capita)							4.909** (2.15)	5.145** (2.15)	5.302** (2.18)			
Exchange Market Enrollment (Per Capita)										6.236 (1.01)	6.156 (0.92)	6.158 (0.91)
Number of Lawyer (Per Capita)	-57.61 (-0.57)	-63.73 (-0.68)	-58.88 (-0.61)	-100.2 (-1.29)	-97.48 (-1.27)	-91.27 (-1.15)	-62.78 (-0.64)	-68.15 (-0.70)	-62.83 (-0.62)	-17.79 (-0.17)	-24.55 (-0.25)	-18.60 (-0.18)
Employment in the Hospital and Social workers	64.43* (1.91)	49.36 (0.91)	41.92 (0.76)	52.04 (1.53)	50.52 (0.93)	43.10 (0.77)	53.49 (1.42)	52.38 (0.98)	44.98 (0.82)	75.32** (2.05)	58.16 (1.07)	51.79 (0.94)
Employment in the Insurance Industry	-156.7 (-1.05)	-143.6 (-0.93)	-159.6 (-1.04)	-173.2 (-1.16)	-154.5 (-0.99)	-170.4 (-1.10)	-172.5 (-1.15)	-152.3 (-0.99)	-168.5 (-1.10)	-135.2 (-0.89)	-121.5 (-0.77)	-134.6 (-0.85)
Real GDP (Per Capita, 1000\$)	-0.0506 (-1.33)	-0.0454 (-1.33)	-0.0422 (-1.22)	-0.0509 (-1.33)	-0.0440 (-1.27)	-0.0404 (-1.16)	-0.0507 (-1.34)	-0.0426 (-1.27)	-0.0392 (-1.16)	-0.0716* (-1.90)	-0.0655* (-1.91)	-0.0631* (-1.83)
Contribution of the Insurance Industry to GDP	-0.120 (-0.87)	-0.120 (-0.89)	-0.119 (-0.89)	-0.0818 (-0.55)	-0.0771 (-0.52)	-0.0755 (-0.51)	-0.114 (-0.85)	-0.108 (-0.83)	-0.107 (-0.82)	-0.126 (-0.87)	-0.122 (-0.89)	-0.122 (-0.88)
Caps on Punitive Damage			-0.224** (-2.55)			-0.149 (-1.67)			-0.203** (-2.28)			-0.159* (-1.73)
Collateral Source Reform			0.408*** (2.69)			0.441*** (2.83)			0.425*** (2.77)			0.378** (2.55)
Constant	8.502*** (3.91)	24.31*** (8.24)	24.52*** (8.13)	25.44*** (11.07)	25.03*** (8.69)	25.17*** (8.52)	24.34*** (10.62)	23.80*** (8.59)	23.97*** (8.45)	24.69*** (10.16)	25.30*** (9.63)	25.47*** (9.53)
Year Fixed Effect	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	194	194	194	186	186	186	194	194	194	194	194	194
Adjusted R-square	0.720	0.854	0.852	0.713	0.854	0.851	0.721	0.854	0.853	0.717	0.852	0.850

Table 5 The Affordable Care Act and the Medical Malpractice Insurance Industry: Log (Economic Loss Ratio)

Dependent Variable: Log (Economic Loss Ratio)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Medicaid Enrollment (Per Capita)	4.895** (2.20)	4.132* (1.77)	4.286* (1.82)									
Percent Change				0.902*** (2.74)	0.800** (2.37)	0.824** (2.40)						
Medicaid and Exchange Market Enrollment (Per Capita)							5.096** (2.30)	4.581** (2.03)	4.737** (2.07)			
Exchange Market Enrollment (Per Capita)										7.165 (1.18)	4.491 (0.68)	4.572 (0.69)
Number of Lawyer (Per Capita)	-81.74 (-0.86)	-84.74 (-0.97)	-79.13 (-0.87)	-112.3 (-1.40)	-107.5 (-1.36)	-100.9 (-1.22)	-83.86 (-0.90)	-87.58 (-0.96)	-81.64 (-0.86)	-37.20 (-0.38)	-48.97 (-0.53)	-42.36 (-0.44)
Employment in the Hospital and Social workers	78.44** (2.40)	33.85 (0.65)	26.66 (0.50)	62.60* (1.86)	34.09 (0.64)	26.88 (0.50)	62.65* (1.70)	36.67 (0.70)	29.54 (0.55)	83.30** (2.36)	41.11 (0.76)	34.96 (0.64)
Employment in the Insurance Industry	-140.9 (-0.97)	-148.9 (-1.00)	-164.4 (-1.10)	-159.6 (-1.09)	-157.5 (-1.04)	-173.1 (-1.14)	-161.6 (-1.11)	-155.8 (-1.04)	-171.5 (-1.15)	-125.6 (-0.84)	-127.5 (-0.83)	-140.4 (-0.92)
Real GDP (Per Capita, 1000\$)	-0.057 (-1.50)	-0.060* (-1.80)	-0.056* (-1.68)	-0.060 (-1.58)	-0.059* (-1.76)	-0.054 (-1.62)	-0.059 (-1.57)	-0.058* (-1.76)	-0.054 (-1.63)	-0.081** (-2.27)	-0.078** (-2.48)	-0.076** (-2.38)
Contribution of the Insurance Industry to GDP	-0.100 (-0.75)	-0.103 (-0.81)	-0.102 (-0.81)	-0.0576 (-0.41)	-0.0628 (-0.46)	-0.0606 (-0.44)	-0.0915 (-0.71)	-0.0922 (-0.74)	-0.0909 (-0.73)	-0.103 (-0.74)	-0.107 (-0.82)	-0.106 (-0.81)
Caps on Punitive Damage			-0.150* (-1.70)			-0.0835 (-0.91)			-0.131 (-1.45)			-0.0958 (-1.03)
Collateral Source Reform			0.430*** (2.89)			0.461*** (2.99)			0.444*** (2.94)			0.400*** (2.76)
Constant	2.348 (1.10)	5.290* (1.81)	5.398* (1.80)	4.358* (1.93)	5.939** (2.08)	5.985** (2.04)	3.326 (1.49)	4.876* (1.74)	4.946* (1.72)	3.829 (1.62)	6.273** (2.30)	6.351** (2.29)
Year Fixed Effect	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	194	194	194	186	186	186	194	194	194	194	194	194
adjusted R Square	0.398	0.532	0.528	0.394	0.528	0.523	0.542	0.534	0.529	0.534	0.527	0.521

Table 6.1: Summary Statistics: Univariate analysis of Economic Loss Ratio (%) (2014-2017)

Group	Observations	Mean	Std Err.	Std. Dev.	[95% Conf. Interval]	
Non-Medicaid Expansion states	68	33.440	0.451	3.721	32.539	34.340
Medicaid Expansion states	132	42.931	0.461	5.293	42.020	43.842
Combined	200	39.704	0.466	6.589	38.785	40.623
Diff		-9.491***	0.720		-10.910	-8.073

Table 6.2: Summary Statistics: States with High Economic Loss Ratio (%) (2014-2017)

States with loss ratio>100%	Frequency	Medicaid Expansion
New Hampshire	1	Yes
Rhode Island	2	Yes
West Virginia	1	Yes
States with loss ratio>80% but <100%	Frequency	Medicaid Expansion
Connecticut	1	Yes
Michigan	1	Yes
Montana	1	Yes
New Hampshire	1	Yes
New Mexico	1	Yes
North Dakota	1	Yes
Rhode Island	2	Yes

Table 7. The Affordable Care Act and the Medical Malpractice Insurance Industry: Log (Premium Earned)

Dependent Variable: Log (Premium Earned)												
Subsample: States with Medicaid Expansion												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Medicaid Enrollment (Per Capita)	-0.183	0.584	0.588									
	(-0.30)	(1.30)	(1.31)									
Percent Change				-0.0593	0.123*	0.120*						
				(-0.55)	(1.89)	(1.82)						
Medicaid and Exchange Market Enrollment (Per Capita)							-0.256	0.719*	0.719*			
							(-0.49)	(1.85)	(1.84)			
Exchange Market Enrollment (Per Capita)										-0.999	1.734	1.702
										(-0.87)	(1.58)	(1.55)
Tort Reform Control Variables	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Year Fixed Effect	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Economic Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	132	132	132	124	124	124	132	132	132	132	132	132
adjusted R square	0.964	0.970	0.970	0.963	0.970	0.971	0.964	0.970	0.970	0.964	0.970	0.970
P Value of Hausman Test	0.003	0.401	0.000	0.008	0.000	0.468	0.003	0.011	0.000	0.006	0.001	0.000
Subsample: States without Medicaid Expansion												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Medicaid Enrollment (Per Capita)	-0.0580	0.198	0.198									
	(-0.08)	(0.27)	(0.27)									
Percent Change				-0.105	-0.059	-0.059						
				(-0.63)	(-0.38)	(-0.38)						
Medicaid and Exchange Market Enrollment (Per Capita)							-0.458	0.043	0.044			
							(-0.71)	(0.06)	(0.06)			
Exchange Market Enrollment (Per Capita)										-1.215	-0.595	-0.626
										(-1.28)	(-0.27)	(-0.27)
Tort Reform Control Variables	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Year Fixed Effect	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Economic Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	68	68	68	68	68	68	68	68	68	68	68	68
adjusted R square	0.985	0.986	0.986	0.985	0.986	0.986	0.986	0.986	0.986	0.986	0.986	0.986

Table 8. The Affordable Care Act and the Medical Malpractice Insurance Industry: Economic Losses Incurred

Dependent Variable: Log (Economic Loss Incurred)												
Subsample Analysis: States with Medicaid Expansion												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Medicaid Enrollment (Per Capita)	5.832**	5.125	4.412									
	(2.29)	(1.46)	(1.37)									
Percent Change				1.124***	1.166**	1.000**						
				(3.51)	(2.47)	(2.12)						
Medicaid and Exchange Market Enrollment (Per Capita)							6.617***	5.993*	5.102*			
							(3.05)	(1.98)	(1.81)			
Exchange Market Enrollment (Per Capita)										16.32**	12.00	9.746
										(2.05)	(1.37)	(1.15)
Tort Reform Control Variables	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Year Fixed Effect	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Economic Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	130	130	130	122	122	122	130	130	130	130	130	130
Adjusted R Square	0.873	0.872	0.480	0.877	0.876	0.479	0.876	0.874	0.485	0.873	0.870	0.474
Subsample Analysis: States Without Medicaid Expansion												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Medicaid Enrollment (Per Capita)	1.030	-0.395	-0.0935									
	(0.11)	(-0.05)	(-0.01)									
Percent Change				0.060	0.087	0.137						
				(0.02)	(0.04)	(0.07)						
Medicaid and Exchange Market Enrollment (Per Capita)							-4.408	0.123	0.136			
							(-0.51)	(0.02)	(0.02)			
Exchange Market Enrollment (Per Capita)										-13.85	2.432	1.216
										(-1.13)	(0.13)	(0.06)
Tort Reform Control Variables	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Year Fixed Effect	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Economic Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	64	64	64	64	64	64	64	64	64	64	64	64
Adjusted R Square	0.682	0.804	0.799	0.810	0.804	0.799	0.809	0.804	0.799	0.811	0.804	0.799

Table 9. The Affordable Care Act and the Medical Malpractice Insurance Industry: Log (Economic Loss Ratio)

Dependent Variable: Log (Economic Loss Ratio)												
Subsample: States with Medicaid Expansion												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Medicaid Enrollment (Per Capita)	5.836**	4.398	5.142									
	(2.48)	(1.37)	(1.46)									
Percent Change				1.146***	1.010**	1.153**						
				(3.76)	(2.16)	(2.42)						
Medicaid and Exchange Market Enrollment (Per Capita)							6.672***	5.102*	5.994*			
							(3.20)	(1.81)	(1.97)			
Exchange Market Enrollment (Per Capita)										16.80**	9.865	11.85
										(2.11)	(1.17)	(1.35)
Tort Reform Control Variables	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Year Fixed Effect	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Economic Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	130	130	130	122	122	122	130	130	130	130	130	130
adjusted R square	0.320	0.485	0.871	0.324	0.485	0.874	0.497	0.485	0.872	0.534	0.479	0.879
P Value of Hausman Test	0.200	0.357	0.480	0.468	0.535	0.748	0.212	0.324	0.426	0.215	0.403	0.557
Subsample: States without Medicaid Expansion												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Medicaid Enrollment (Per Capita)	0.737	-0.911	-0.726									
	(0.08)	(-0.12)	(-0.10)									
Percent Change				0.045	0.019	0.051						
				(0.02)	(0.01)	(0.03)						
Medicaid and Exchange Market Enrollment (Per Capita)							-4.173	-0.388	-0.379			
							(-0.50)	(-0.06)	(-0.06)			
Exchange Market Enrollment (Per Capita)										-12.73	1.971	1.211
										(-1.06)	(0.10)	(0.06)
Tort Reform Control Variables	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Year Fixed Effect	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Economic Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	64	64	64	64	64	64	64	64	64	64	64	64
adjusted R square	0.561	0.531	0.532	0.566	0.544	0.532	0.561	0.544	0.531	0.567	0.544	0.532

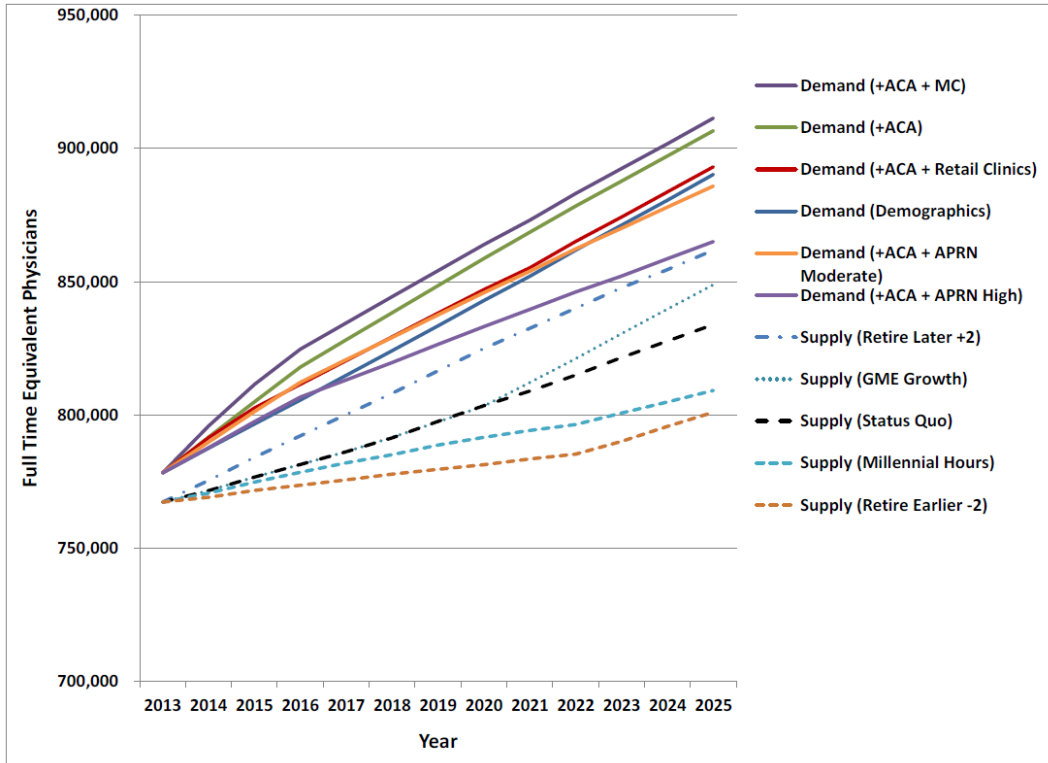
Table 10 Average Treatment Effect on the Treated of Medicaid Expansion

		Premium Per capita		Economic Loss Ratio		Log(Economic Loss Incurred Per Capita)	
Average Treatment Effect on the Treated							
		ATT	average	p.value	ATT	Average	p.value
		0.028		0.386	0.125**		0.046
						2.223*	0.078
Period	Number of Treated	ATT	P value	ATT	P value	ATT	P value
Post-Treatment Period							
0	0	0.807*	0.044	0.053	0.230	1.235	0.148
1	29	1.320***	0.006	0.051	0.368	3.540	0.374
2	28	1.071**	0.024	0.122**	0.036	5.4411***	0.000
3	24	0.378	0.382	0.163***	0.004	6.067***	0.000
4	4	-2.780	0.930	0.219*	0.076	10.743**	0.014
5	4	-2.065	0.852	0.274**	0.026	12.276**	0.048
6	3	-3.376	0.946	0.261	0.150	13.735**	0.014
7	1	-13.215	0.888	0.054	0.858	23.953*	0.088
8	1	-12.085	0.968	0.059	0.774	25.441	0.160
9	1	-11.776	0.974	0.212	0.704	29.202***	0.004
10	1	-8.006	0.808	0.052	0.868	21.738	0.120
Other Covariates							
GSP Per Capita		0.000*	0.064	0.000	0.636	-0.0002	0.206
Employment in the Insurance Industry per capita		103.600	0.918	71.730***	0.01	946.3	0.082*
Employment in the Healthcare system per capita		427.000**	0.028	7.270	0.384	225.2	0.200
Citizen Ideology Index		0.007	0.634	0.000	0.81	0.072	0.120
Lawyer Per Capita		1282.000	0.588	131.400	0.118	1551.0	0.434
Factor Number		4		1		2	

Note: Table 10 reports the average treatment effect of Medicaid Expansion on the medical malpractice insurance industry performance measured by premium per capita, economic loss per capita, and economic loss ratio. Table 10 also reports the treatment effect in each post treatment period and marginal effect of control variables. *, **, and *** indicate significance at the 10, 5, and 1 percent level, respectively.

Figure 1: Projected Total Supply and Demand for Physicians, 2013-2025

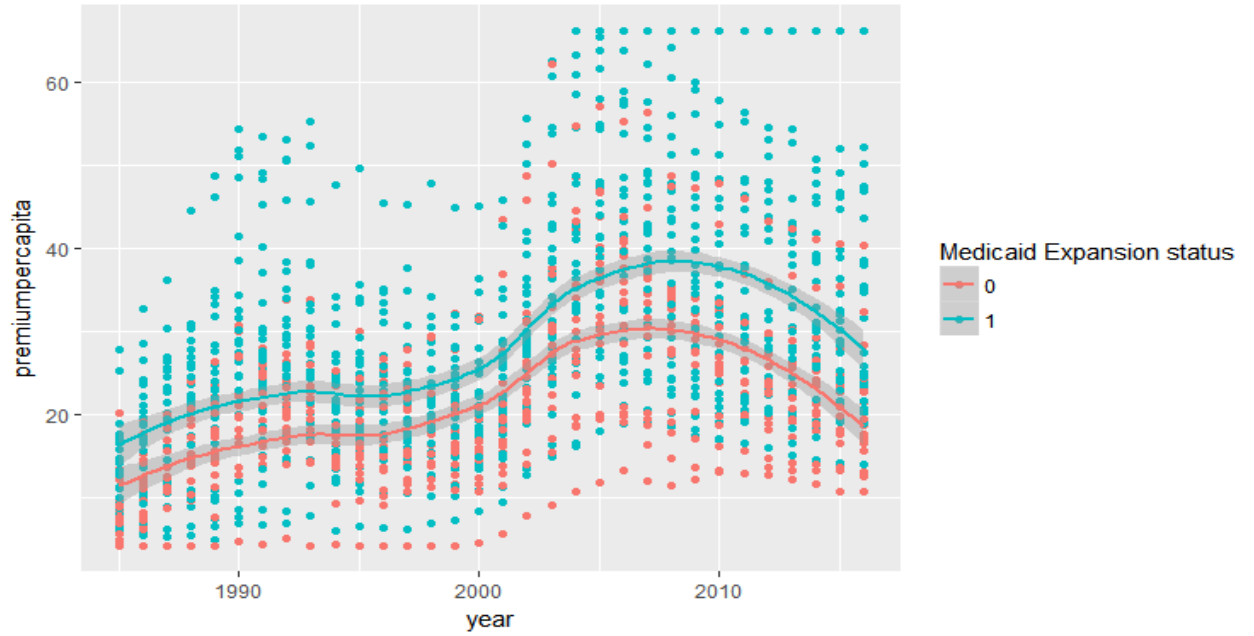
Figure 1.1 from AAMC summarizes the projected supply and demand for physicians considering the impact of the ACA and other scenario including Managed Care (MC), increased use of retail clinics, use of advanced practice nurses (APRN). Between 2013 and 2025, changing demographics and public policies are projected to increase national demand for physicians from 778,200 to 890,300. The expanded healthcare coverage under the ACA is estimated to increase the demand by about 16,400 (+2%) physicians. In contrast, total physician supply is projected to increase from 767,200 in 2013 to 833,900 in 2025. As presented in Figure 1.1, the projected demand exceeds the projected supply between 2013 and 2025.



Source: The Complexities of Physician Supply and Demand: Projections from 2013 to 2025 (Association of American Medical Colleges)

**Figure 2.1: Medical Malpractice Insurance Industry Performance:
Premium Per Capita (1986-2016)**

Figure 2.1 illustrates the trend of the average premium per capita of the medical malpractice insurers from 1986 to 2016. Points represent the premium per capita in each individual state while lines represent aggregated premium per capita in the Medicaid expansion and non-expansion states. Points or lines in blue indicates Medicaid expansion states while in orange indicates Medicaid non-expansion states.



**Figure 2.2: Medical Malpractice Insurance Industry Performance:
Loss per capita (1986-2016)**

Figure 2.2 illustrates the trend of economic losses incurred per capita (figure 2.2.1) and economic loss ratio (figure 2.2.2) of the medical malpractice insurers from 1986 to 2016. Points represent losses incurred per capita (or loss ratio) in each individual state while lines represent aggregated losses incurred per capita (or loss ratio) in the Medicaid expansion and No-expansion states. Points or lines in blue indicates Medicaid expansion states while in orange indicates non-expansion states.

Figure 2.2.1: Economic Loss Incurred Per Capita

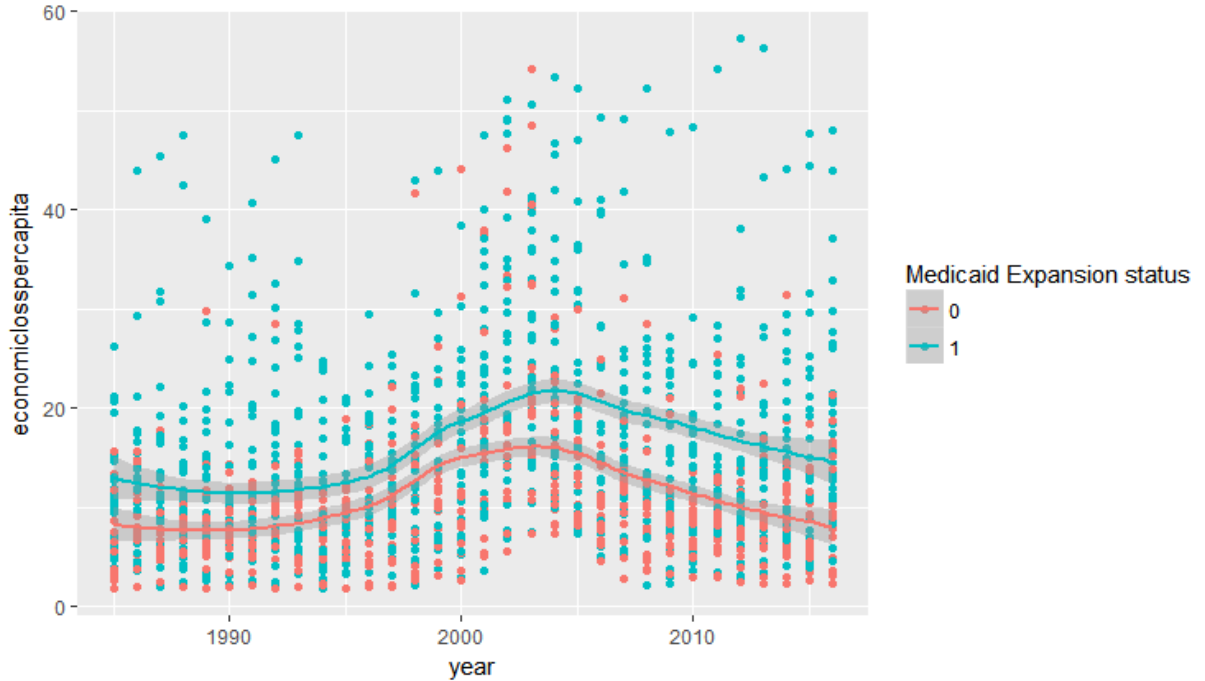


Figure 2.2.2: Economic Loss Ratio



Figure 3.1: Average Treatment Effect of Medicaid Expansion on Medical Malpractice Insurance Premium Performance (1986-2016)

Figure 3.1 plots the average premium performance of the medical malpractice insurance industry from 1986 to 2016 in the treatment group and in the synthetic control group. The treatment is Medicaid expansion and the counterfactual is estimated by the generalized synthetic control methods. Figure 3.1 shows that levels of premium per capita in the expansion states and in the counterfactual synthetic control group were similar in the pretreatment period and were similar in most posttreatment periods.

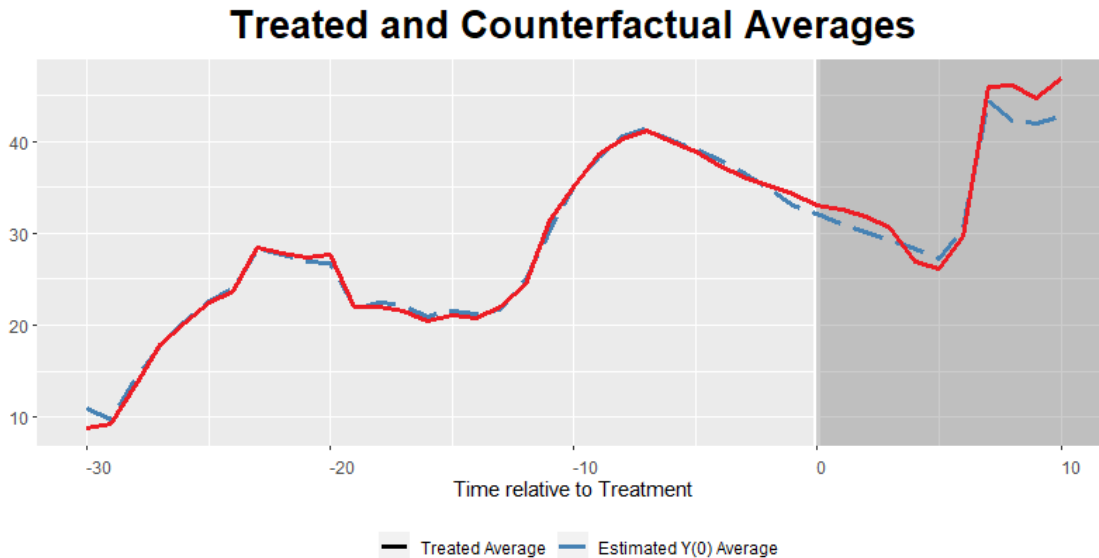


Figure 3.2: Average Treatment Effect of Medicaid Expansion on Medical Malpractice Insurance Loss Performance (1986-2016)

Figure 3.2.1 and 3.2.2 plot the average loss performance of the medical malpractice insurance industry from 1986 to 2016 in the treatment group and in the synthetic control group. The treatment is Medicaid expansion and the counterfactual is estimated by the generalized synthetic control methods. Figure 3.2 shows that for economic loss ratio and economic loss per capita the trends in the treated and synthetic control groups diverge in the post treatment period of Medicaid expansion. States with Medicaid expansion experience much higher economic loss ratio and loss per capita than the counterfactuals. The gap reflects the impact of Medicaid expansion.

Figure 3.2.1 Treatment Effect on the Treated (Economic Loss ratio)

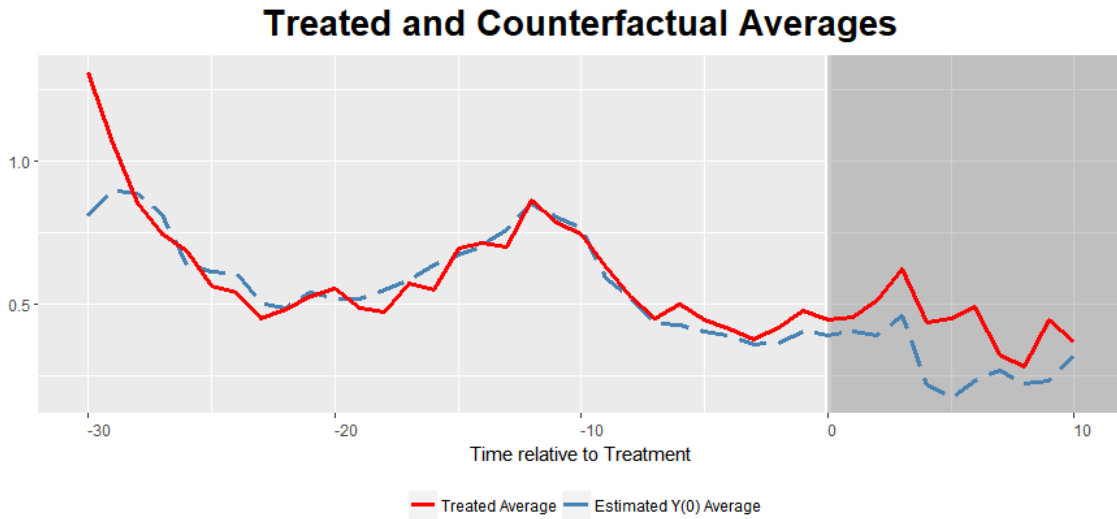


Figure 3.2.2 Treatment Effect on the Treated (log Economic Losses Per capita)

