Accounting Discretion and Regulation: Evidence from Health Insurers and the Affordable Care Act[*]

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Abstract

Under the Patient Protection and Affordable Care Act (ACA), health insurers are required to spend a certain portion of premium revenue on policyholder benefits; the failure to do so triggers rebate payments to policyholders. The calculated claims amount includes not only realized payments, but also estimated future payments for claims that have either not been reported or not been finalized. As a consequence, the ACA changed incentives for how firms estimate their claims and liabilities. We exploit pre-ACA variation in state-level regulation as well as granular claims information from insurers' ACA filings to study how this type of regulatory oversight influences health insurer reporting. We find consistent evidence of reporting management in both the pre-ACA period and the post-ACA period. Specifically, we find that 1) prior to the ACA, insurers subject to state-level regulation overestimated loss reserves; 2) the ACA's enactment led to previously-unregulated insurers increasing their reserve overestimates; and 3) insurers' regulatory-related over-reserving was mitigated by the presence of a Big 4 auditor or actuarial firm. Finally, we find evidence in the post-ACA period that insurers below ACA thresholds have systematically overstated their claims, leading to an estimated 10% underpayment of policyholder rebates.

1. Introduction

In 2010, Congress passed the Affordable Care Act (ACA), which, among other things, imposed a minimum spending requirement on certain health insurers. In particular, the ACA mandated that covered health insurers pay out policyholder rebates if those insurers failed to achieve a specified financial target known as a Medical Loss Ratio (MLR), which essentially represents the portion of an insurer's premiums ultimately paid out in claims or spent on activities designed to improve health care quality. The goals of this requirement were to incent insurers to direct more of their costs to benefit their customers and to help lower aggregate insurance costs. The MLR requirement was viewed as a core component of the ACA, and subsequent increases in insurers' MLRs have been viewed as evidence that this aspect of the Act was working as planned (Cox et al. 2013; Fontenot 2014).[1]

In this paper, we examine whether this type of minimum spending regulation influences how insurers estimate the losses underlying their calculated MLRs. When calculating MLRs, claim payments in the numerator include actual disbursements made during that period as well as an estimate of future payments related to current period claims.[2] As a consequence, insurers can directly influence whether or not they achieve the minimum MLR requirements by manipulating their estimated claims payments.

We focus on insurer behavior in the pre-ACA period, where we exploit state-level variation in MLR requirements, as well as the post-ACA period, where we examine more detailed filing information resulting from the ACA's new reporting requirements. Following prior literature

[1] For example, Cox et al. (2013) document an increase in weighted-average MLRs from 2010 to 2012, particularly for the individual insurance market that was viewed as most in need of regulation, which they interpret as evidence of realized savings for consumers and businesses.

[2] Including estimated future payments in the claims amount was controversial, and the ACA provides specific guidance on the calculation of these estimates. We discuss the regulation in greater detail in Section 2.

studying earnings management in the insurance industry (e.g., Petroni 1992; Beaver et al. 2003; Gaver and Paterson 2004), we calculate reserve errors as the difference between insurers' initial estimates of total claims minus the subsequent realization of those claims. We empirically test our hypotheses by regressing these errors on MLR regulation measures as well as controls for discretionary and non-discretionary determinants of insurer loss reserve errors. We perform this analysis in the pre-ACA period (2003 to 2010, exploiting state-level differences in MLR regulation) and then exploit the ACA's regulatory change to perform a difference-in-differences analysis across those two periods.[3] Finally, we examine line-level claims information (i.e., claims reported separately for individual policies, small group policies, and large group policies) to assess insurers' reporting under the ACA.[4]

We offer four main results. First, in the pre-ACA period, we show that firms operating under state-level MLR regulation tended to overestimate loss reserves relative to firms operating in states without such regulation. Second, we find that firms operating in states with no state-level MLR regulation experienced a significant increase in their reserve estimate errors after ACA enactment, relative to firms who had already been operating under state-level MLR regulation. (These first two results are robust for controlling for state-level differences using Property & Casualty insurers who are not subject to federal or state-level MLR regulations.) Third, in the post-ACA period, we find evidence that firms whose true MLRs were below the ACA thresholds systematically overestimated their incurred claims, resulting in significant rebate underpayments.

[3] As we discuss later, our analysis is not a true difference-in-differences, as the ACA's MLR requirements were generally stricter than the existing state-level MLR requirements. As a consequence, insurers in *all* states were subject to an increase in regulation. Our regulatory "treatment" comes from the fact that insurers operating in states with no state-level MLR regulation experienced a greater regulatory shock than insurers already subject to state-level MLR regulation.

[4] Under the ACA, insurers are required to achieve a minimum MLR for each line of business in which they operate, with the different lines of business subject to different MLR thresholds. As a consequence, examining line-level loss reporting gives us a cleaner look at insurers' reporting incentives as compared to looking at their aggregated firm-level loss reporting.

Specifically, we estimate that the insurers in our sample would have paid in excess of $200 million more in policyholder rebates (10% of actual rebates paid) if those rebate calculations had used *ex post* accurate claims numbers. Finally, we find evidence that the extent of insurers' discretion is limited by high-quality external monitoring, although this result is only statistically significant in the pre-ACA analyses.

Taken together, these results suggest that mandatory reporting requirements at both the state and federal levels led to insurers adjusting their reported financial information through increased claims reserves, as well as to underpayment of policyholder rebates required by the ACA. Notably, the rebate underpayment is greatest in the individual market, which ostensibly experienced the greatest increase in MLRs following the ACAs enactment (Cox et al. 2013; McCue et al. 2013).[5] Our results emphasize that researchers and analysts evaluating the effects of the ACA, and regulatory actions in general, should take into account the managerial discretion inherent in reported metrics like the MLR.

In addition, we make several contributions to the broader academic literature. First, we show that both state-level and federal-level regulation influences firms' financial reporting, even when that regulation is not directly tied to firms' financial statements or imposed by a finance-oriented entity like the SEC or the Federal Reserve Board. Second, we contribute to the literature examining the impact of the ACA on the healthcare industry, broadly, and on the health insurance industry specifically, by showing potential unintended consequences of MLR regulation, namely financial statement manipulation. Third, we contribute to the accounting literature that examines earnings management by not only providing evidence of accruals management, but also by

[5] Cox et al. (2013) note that the fewer than half of plans in the individual market met the ACA's MLR threshold in 2010, while the majority of small group and large group plans were already meeting their ACA thresholds prior to the ACA's enactment.

quantifying the benefits of that accruals management and identifying the parties bearing the cost of misreporting – in this case, the policyholders who were under-compensated by insurers failing to meet their required MLR levels.[6]

The remainder of the paper proceeds as follows. Section 2 provides detailed background on ACA regulation and health insurer loss reporting. In Section 3 we develop our hypotheses. In Section 4 we provide details on our dataset and empirical strategy. We present our results in Section 5 and briefly conclude in Section 6.

2. Regulatory Background and Prior Literature

2.1. Medical Loss Ratio Regulation

In 2010, the ACA was signed into law as a remedy to what some perceived as a systematic failure of the U.S. health care system, with the goal of providing health care to the population at a reasonable (i.e., lower) cost. A significant component of the legislation involved an overhaul of the private provision of health insurance. Among other goals, the legislation aimed to both reduce the cost of insurance and increase the availability (and take-up rates) of health insurance. One mechanism put in place to minimize costs was a policyholder rebate if an insurer did not spend a certain fraction of premiums on health care expenditures (Kirchoff 2014). This mechanism was designed to ensure that health insurers are not charging excessive premiums (net of the rebate) relative to the benefits provided to policyholders.

In particular, the ACA modified Section 2718 of the Public Health Service Act, which requires health insurers to report, on an annual basis, their medical loss ratio (MLR). If the insurer

[6] Echoing Cox et al. (2013), the cost to policyholders likely extends beyond underpaid rebates. To the extent that regulators take MLRs into account when approving premium increases, overstated MLRs can lead to increased future premiums. The analysis of premium increases is beyond the scope of our study.

is not "spending enough" as measured by the MLR, the health insurer must issue rebates to policyholders such that their MLR meets the minimum set by the ACA regulation. The minimum spending requirement varies for the type of insurance sold. For insurance plans covering individuals and small groups, health insurers must spend 80% of premiums on medical expenses. For large group plans, ACA requires health insurers to spend 85% of premiums on medical expenses.[7]

Achieving the ACA's minimum MLR levels has not been trivial, as can be seen from both pre-ACA and post-ACA experience. Figure 1 provides historical industry MLRs by year. In this case, the MLR is defined as total hospital and medical claims less reinsurance recoveries as a percentage of net premium income, which we term the "traditional" MLR calculation. While this definition of MLR is slightly different from that mandated by the ACA, this figure provides some context for current ACA minimum MLR requirements.[8] Notably, the 25th percentile of MLR is less than 80 percent in every year going back to 2001, which indicates that the current regulation is binding for many firms. The minimum MLR levels continue to be binding in the post-ACA period - Table 1 shows that the insurers in our sample paid more than $2.2 billion in rebates for the 2011-2015 post-ACA period.[9]

[7] This description simplifies the actual calculations. For ACA reporting purposes, insurers may include in their numerator both claims paid (and reserved) as well as expenditures made to improve the quality of consumers' care. The denominator includes earned premiums net of regulatory fees, taxes, and licensing fees. There are also "credibility adjustments" to account for random variation in claims experience.

[8] In general, the traditional MLR will be lower than the MLR reported using the ACA's formula, because the ACA introduced additional components. A study from the GAO (Government Accountability Office, 2011) indicated that the additional components of the ACA's MLR calculation would add about 5-7% to the traditional MLR calculations we use in this graph. As we discuss in greater detail later, we use the ACA's definition of MLR when that data is available (in the post-ACA period), but use the traditional MLR calculation for the pre-ACA period and the pre- to post-ACA comparison because data on those additional components are unavailable in the pre-ACA period.

[9] Our sample, due to various data requirements, does not represent the full universe of MLR-reporting firms. The rebates paid by insurers in our sample represent approximately 80% of the total rebates paid out under the ACA's MLR requirements over this period.

A subset of health insurers were subject to a similar form of MLR oversight prior to the ACA. Specifically, 34 states had previously enacted state-level regulation requiring insurers to report their MLRs on an annual basis. Although usage of MLR reports varied across states, most states used MLR reporting requirements to regulate rates on a prospective basis, rather than requiring that insurers return "excess" premium dollars to policyholders. That is, state regulators (who approve insurers' proposed premium levels) would typically use the MLRs as justification for determining whether proposed insurance rates were reasonable (see, for example, Cicala et al. 2017).[10] Figure 2 shows the states (shaded in blue) with some form of MLR regulation. We use the enactment of the ACA as well as the variation in pre-ACA state regulations to assess whether MLR regulation influences insurers' financial reporting estimates.

2.2. Accounting for Loss Reserves in the Insurance Industry, and their effect on MLRs

Prior studies have examined the effects of the ACA in the context of medical loss ratios.[11] McCue et al. (2013) study the short-window change in performance metrics (including the MLR) around the ACA's enactment. They find a significant increase in reported MLRs, particularly for the individual insurance market; they document a 5.5% increase in the individual market from 2010 to 2011, but only a 0.7% increase in the small group market, and a 0.7% decrease in the large group market. Cicala et al. (2017) examine how affected insurers achieve higher MLRs, and conclude that insurers tend to pay out higher claims rather than lowering policyholder premiums. Cicala et al., too, report a much larger effect in the individual market than in the group market.

[10] Six states did have strict rules around MLR reporting and required policyholder rebates.
[11] This is in addition to the many papers studying the effect of the ACA on healthcare outcomes and insurance coverage, such as Baicker et al. (2013), Barbaresco et al. (2015), and Sommers et al. (2015).

While existing studies in this area take insurers' reported claims at face value, an unexamined aspect of this setting is the fact that reported claims are an estimated number, subject to both significant uncertainty and manipulation. Specifically, when measuring health insurance losses for a given period (e.g., to determine the numerator of an MLR), those losses can be grouped into three categories. First, there are the claim payments that have already been paid as of the measurement date. Though some of these paid claims may be re-opened or subsequently recovered by the insurer through subrogation, these paid claims are generally considered to be known. Second, claims that have been reported (whether partially paid or not) can have payments that extend into the future, either because the claim is re-opened or because it simply has a long payout duration. These unpaid, reported claims are generally referred to as incurred losses and are estimated by insurers. Finally, insurers also estimate losses from "incurred but not reported" (IBNR) claims. With IBNR claims, insurers estimate future payouts for events having occurred in the given period, but for which no claim has been filed as of the measurement date.

The total estimate for unpaid claims is referred to as the loss reserve, and that number represents the single largest liability on an insurer's Balance Sheet. Moreover, this estimate offers the potential for manipulation in a variety of ways. Underestimating the reserve would make the insurer appear more financially stable (because of lower reported liabilities on the Balance Sheet), while overestimating the reserve would increase current Balance Sheet liabilities, but generate future earnings benefits as the excess liability reverses (similar to the stereotypical "big bath" reserve). And, most pertinent to our study, overestimating the reserve in a given period would increase the insurer's reported MLR.

The Department of Health and Human Services (HHS) explicitly discussed the appropriateness of reserve inclusion in MLR regulation (Department of Health and Human Services 2010):

> *HHS received numerous comments from consumer groups, issuers, and regulators regarding whether, and to what extent, reserves should be included in incurred claims. A consumer advocacy group felt that only paid claims should be used, arguing that the use of actual claims paid is reasonable because the review is historical; this would avoid the possibility of issuers gaming the system by manipulating reserves. However, several issuers and regulators support the inclusion of unpaid claims reserves in incurred claims. A State regulator indicates that the advantage of such inclusion is that it deals only with data for the one year in which claims are incurred, and avoids any distortion due to possible errors in the estimate of the unpaid claim reserve as of the beginning of the year. The disadvantage is that the result is unduly influenced by the unpaid claim reserve as of the end of the year.*

Thus, the details of the MLR calculation – and, notably, the possibility that firms could manage reported losses to circumvent the MLR regulation – were a concern of consumers, regulators, and firms.

Critical to our study, a final aspect of insurance company accounting and reporting is that state-level regulation requires that insurers report the evolution of their loss estimates, referred to as loss development. In particular, insurers are required to report how total loss estimates (the combination of paid claims and estimated unpaid claims) change over time for each reporting year. This reporting allows regulators (and academics) to observe the development of the claims and to observe the "error" in the reserves initially reported. As Beaver et al. (2003) note, this error is analogous to a forecast error; if insurers make unbiased estimates of future claims, that error will be, on average, zero.

In addition to the already-existing state-level reporting requirements, the ACA requires insurers to file more detailed information on an annual basis to demonstrate their compliance with the MLR regulation. For those insurers not meeting the MLR threshold, these annual reports

provide a detailed calculation of the rebates they were ultimately required to distribute to their policyholders. Specifically, insurers are required to calculate an MLR for each of the three lines in which they write policies (i.e., individual, small group, and large group). This calculation includes claims data for the current year and the previous two years, premiums for those years, and the various other components of the ACA's definition of the MLR.[12] Importantly, insurers are required to update their estimated claims for their prior periods, which allows us to calculate reserve errors for each insurer on a line-level basis. As we discuss later, this data also allows us to calculate what insurers' rebate amounts *would have been* if their claims had been estimated accurately in original filing year.

2.3. Prior Literature on earnings management

An enormous literature examines various forms of earnings management in many different settings. Well-known examples include the management of earnings to increase executive bonus payments (Healy 1985), to meet or beat financial targets (Burgstahler and Dichev 1997), or to meet regulatory requirements (Petroni 1992). A more thorough discussion of this literature can be found in Dechow et al. (2010). Our paper touches upon several existing strands within the earnings management literature.

In the property-casualty insurance industry, loss reserve errors have been linked to various earnings-related incentives. Early studies using insurer reserve errors (Weiss 1985; Grace 1990; Beaver et al. 2003) focused on earnings smoothing. The conclusion from these studies is that insurers manage reserves in order to minimize the variability of income. Later studies (e.g., Petroni 1992; Gaver and Paterson 2004) show that insurers seem to use reserving practices to avoid

[12] The other components of the calculation include quality improvement expenditures, which are added to the numerator, and taxes, licensing and regulatory fees, which are subtracted from the denominator (Kirchoff 2014).

regulatory scrutiny. In particular, the Insurance Regulatory Information System (IRIS) ratios, used as a regulatory tool by the National Association of Insurance Commissioners (NAIC), can be manipulated with reserving practices. In our setting, manipulating reserves would directly affect insurers' reported MLRs.

Related literature examines whether better monitoring (e.g., high quality auditors or "better" corporate governance) influences firms' ability to manage earnings. Again, Dechow et al. (2010) discuss this broad literature. This question has been addressed in the insurance context, as well. Specifically, studies like Petroni and Beasley (1996) and Gaver and Paterson (2001, 2007) provide evidence that auditors and actuarial firms (as a different type of external monitor) may help mitigate earnings management through loss reserve manipulation. We expect that high quality monitors are likely to influence the extent to which insurers manipulate their financial reporting in response to MLR regulation.

3. Hypotheses

Our overall research question is whether, broadly speaking, MLR regulation influences insurers' financial reporting. We have four specific hypotheses.

Our first hypothesis relates to the incentive for insurers to manipulate their loss reserves to meet a minimum MLR imposed by state regulators in the pre-ACA period. We expect that states with MLR reporting requirements created an incentive for insurers in those states to overestimate their reserves in an effort to increase reported MLR. Although few states actually required insurers to pay MLR-based rebates in the pre-ACA period (Kirchoff 2014), it was far more common for states to use reported MLRs as justification to approve or deny an insurer's proposed premium

rates; increasing reported MLRs increases the likelihood that state regulators would approve rate increases.[13]

H1: Health insurers operating in states with minimum MLR requirements will over-estimate losses relative to insurers operating in states without MLR regulation.

Our next hypothesis focuses on the effect of the ACA. Although the ACA raised MLR standards for all insurers nationwide, we expect that the ACA differentially affects insurers depending on the location of those insurers. Insurers already operating under state-level MLR reporting experienced relatively less change compared to insurers operating in states without such reporting. Therefore, we expect insurer response to the ACA's reporting requirements to differ depending on whether they were subject to pre-ACA MLR reporting.

H2: Health insurers operating in states without minimum MLR requirements will increase their estimation of reserves following ACA enactment, relative to firms operating in states with minimum MLR requirements.

Our third hypothesis focuses on the post-ACA period. We expect that the incentive to manipulate loss reserves is especially pronounced if the MLR requirement is binding. That is, if an insurer's true MLR falls below the minimum threshold, that insurer can avoid regulatory scrutiny, face a higher likelihood of rate approvals, and avoid paying rebates by increasing their MLR to meet the minimum threshold.[14]

H3: Health insurers whose true MLRs are below the MLR requirement will be more likely to over-estimate losses than insurers whose true MLRs meet or exceed the MLR requirement.

[13] One insurance consultant that we spoke to indicated that she would not even submit a proposed rate increase for insurers that failed to meet state-level required MLR.

[14] Detailed data resulting from the ACA's reporting requirements allows us to assess this hypothesis in the post-ACA period. Unfortunately, data limitations prevent us from assessing this hypothesis in the pre-ACA period. Specifically, we do not have sufficient information about the state-level MLR minimums by line of operation, nor do we have actual MLR information by line of operation.

Finally, we examine the degree to which outside forces can discipline health insurers' ability to over-state their reserves. In particular, we hypothesize that higher quality external monitors (e.g., Big 4 auditors and affiliated actuaries) will reduce the earnings management seen in firms. This is particularly true in our setting, as the NAIC's MLR reporting instructions explicitly encourage verification that claims liabilities and reserves are not consistently overstated.[15]

H4: Health insurers utilizing high-quality external monitors (Big 4 audit firms and Big 4 actuaries) will exhibit less reserve over-statement and reduced QIE reporting.

4. Research Design

4.1. Data

Our data comes from one of two sources, depending on the time period. For analyses using pre-ACA data, we obtain reserve information from annual statutory filings made by health insurers with the National Association of Insurance Commissioners between 2002 and 2011.[16] Our sample focuses on affiliated and unaffiliated individual firms, and we exclude firms from our sample that have non-positive direct premiums written or surplus. We also exclusively examine firms that operate entirely within a single state, so that we can clearly determine whether they were subject to state-level MLR regulation. (Since the majority of health insurers operate in a single state, this restriction is not particularly stringent.) This focus allows us to perform a clean test on the impact of MLR regulation on reserving. Our pre-ACA sample consists of 3,368 firm-year observations consisting of 594 unique firms from 2003 to 2010.

[15] http://www.naic.org/documents/committees_e_examover_related_mlr_procedures_temp.pdf, page 8.
[16] The NAIC has several types of statutory statements depending on the operations of insurers. Here, we use the "Health" statement. There are also statements for "Property/Casualty", "Life/Accident & Health", "Title", and "Fraternal".

We also use insurer statutory filings when testing the effect of the ACA's implementation on insurer reporting behavior. Here, we use statutory filings from 2002 to 2016. The final sample consists of 6,098 firm-year observations representing 762 unique firms from 2003 to 2015.

Consistent with prior research (e.g., Beaver et al. 2003), we measure the loss reserve error by comparing insurers' initial estimates of incurred claims for a given period, compared to subsequently updated (and thus, more accurate) claims for that same period. We then scale this error by the insurer's updated claims. For calculations involving pre-ACA data (i.e., both the pre-ACA analysis and the change around the ACA), we obtain this data from the "Underwriting and Investment Exhibit Part 2C – Development of Paid and Incurred Health Claims, Section B – Incurred Health Claims" from insurers' annual statutory statements, an example of which is presented in Figure 3. In that figure, the boxed values in column 4 aggregate to $2,287,521, which represents the insurer's cumulative estimated losses experienced through 2011, estimated as of the end of 2011. The boxed values in column 5 aggregate to $2,374,265 of estimated losses for the same event years, but with an additional year of claims development. The 2011 reserve error is equal to the boxed values in column 4 minus the boxed values in column 5.[17] A positive value for the loss reserve error indicates that the initial estimate was higher than the eventual development (over-reserving), while a negative value indicates the opposite. In this case, as of 12/31/2011, the insurer underestimated total losses by $86,744.

When testing for reporting manipulation in the post-ACA period, we continue to use the same approach of calculating the reserve error, but use more detailed data from the Centers for Medicare & Medicaid Services website (www.cms.gov), which provides data on insurer MLR filings. Specifically, this data includes an insurer's reported MLR by line of operation, as well as

[17] Column 5 includes an additional line for losses incurred in 2012 that would not be included in the reserve error calculation.

the components underlying the calculated MLR. Like the state-mandated statutory reports illustrated in Figure 3, each annual ACA filing updates the reported claims figures from the prior two years. Figure 4 illustrates how we calculate reserve error with this post-ACA data, using the 2012 and 2013 filings for Aetna Life Insurance Company of Connecticut. The ACA requires that each insurer report separately for each line of business in which they write insurance; here, we show Aetna's reported claims in the individual market.

In their 2012 filing, Aetna reported $43,049,881 of current year (2012) claims, labeled "CY", and $30,922,010 of prior year (2011) claims, labeled "PY1". In their subsequent 2013 filing, Aetna reported a revised $43,128,985 of 2012 claims (in the PY1 column) and $30,381,587 of 2011 claims (in the PY2 column). We calculate the 2012 claims error as the difference between the 2012 estimated claims and the revised estimates in the 2013 filing. In this case, we would say that Aetna over-estimated claims by $461,319 in 2012. The ACA filings also include the insurer's reported MLR as well as their MLR "target".[18] We use this data later on to identify which insurers are operating at a "true" MLR beneath their MLR threshold.

We merge this data with state statutory filings from 2010 to 2015.[19] Because we require forward-looking data to measure reserve error, our post-ACA analysis period consists of data from the 2011 through 2015 event years. To ensure that any reserve estimation errors are not the result of business combinations or other structural firm changes, we check whether a firm's MLR denominator is the same in subsequent yearly filings (i.e., the MLR denominator in 2012 matches

[18] We could calculate a traditional MLR based on insurers' reported claims and premiums, similar to the data underlying Figure 1. However, this traditional MLR is a noisy measure of how the firm is evaluated under ACA regulations and what the firm actually reported in their MLR filings; the traditional measure does not incorporate adjustments for quality improvement expenditures, regulatory fees and taxes, or credibility adjustments. The filings from the CMS provide the more relevant ACA-based MLR calculations and minimum MLR benchmarks. The reported benchmarks from the CMS data also reflect any state MLR waivers that have been granted.

[19] The post-ACA data encompasses more firms than the pre-ACA analyses because it includes any insurer writing health insurance and reporting to the CMS, even if they primarily operate in some other line of business. In contrast, the pre-ACA analysis only includes insurers operating entirely in the health insurance area.

the MLR denominator reported in 2013). We exclude firms with premiums that differ by more than one percent in absolute value. We also exclude firms with missing data that would be necessary to construct their reserve error or MLR. Our final post-ACA sample consists of 7,686 firm-state-line-year observations representing 1,351 unique firms.

It is worth noting how our error measure differs from that used in prior insurance literature. Studies examining property-casualty insurer reserve errors generally use five years of development to measure reserve error (e.g., Petroni 1992; Beaver et al. 2003; Grace and Leverty 2010). For a number of reasons, we use only a single year of development in this study. First, health claims tend to have a substantially shorter tail compared to property and casualty losses. Table 2 provides data on the percentage of ultimate losses paid after each year.[20] On average, health insurers pay 88.9% of claims in the first year (t_0) and 98.7% of claims by the end of the second year (t_1). For property-casualty insurers, approximately 88% of claims are paid by the end of the fifth year and 98% of claims are paid out within 10 years (e.g., Grace and Leverty 2012). This comparison suggests that in using a one-year error for health insurers, we are capturing a much greater percentage of paid claims compared to the majority of studies that examine property-casualty insurer reserve errors using five-year errors.

A second, and more practical, motivation for using one-year errors is the data limitation inherent in constructing loss reserve errors. The strength of loss reserve errors as a measure of managerial discretion comes from the ability to observe revised estimates of initial loss reserves, the same way that earnings forecasts are appealing because we observe the eventual earnings realization. However, accurately measuring "true" losses requires lead years of data. If we use the maximum amount of data available in the Underwriting and Investment Exhibit – Part 2C, we

[20] We note that our "ultimate" loss is defined by the last available reporting year (e.g., four years from the initial loss). If losses continue to develop past four years, the statistics reported below would change slightly.

could construct a four-year reserve error. However, this requires four lead years of data. For our pre-ACA analysis, this would not limit our sample.[21] However, we would not be able to analyze a meaningful sample of post-ACA estimates using four-year errors. Accordingly, we construct one-year errors, which allows us to examine the first five years of ACA MLR regulation (2011 through 2015), as we require only one lead year of data (i.e., construct the 2015 error using 2016 statutory filings). Consistent with prior studies examining reserve bias (Petroni 1992; Beaver et al. 2003; Grace and Leverty 2010), we exclude firms with extreme errors in their loss reserves. Specifically, we exclude firms where the revised reserve estimate differs from the initial estimate by more than 50 percent in absolute value. Finally, we exclude firms that report negative losses.

4.2. Empirical Strategy

We test our hypotheses using several different approaches. First, we focus on the pre-ACA period and measure the degree to which loss estimates vary among those health insurers operating in states with MLR regulation compared to insurers not subject to state-level regulation. Next, we use the ACA's implementation of national MLR regulation as a natural experiment. Using a difference-in-differences approach, we estimate the degree to which health insurers change their estimation behavior in response to the newly imposed regulation. Finally, we examine reserve management to avoid MLR regulation in the post-ACA period by specifically looking for evidence of claims management among firms whose true (i.e., before manipulation) MLR was below their minimum MLR requirement. We describe our various empirical models more specifically below.

[21] In our pre-ACA tests, our conclusions are unaffected if we use three- or four-year reserve errors instead of the one-year reserve errors presented in our tables. However, we prefer to use a one-year reserve error in the pre-ACA period to avoid using post-ACA data in the reserve error calculation (e.g., using 2012 reported claims to evaluate 2008 reserve error), as the ACA likely influenced the manner in which firms reported their claims.

4.2.1. State-Level Regulation Model in the pre-ACA period

Using state-level variation in MLR regulation, we estimate a model designed to capture differences in loss estimation behaviors by health insurers operating in states with differing MLR regulation. This initial model provides a test of H1. We then augment this model to include a variable measuring the quality of external monitoring, which provides a test of H4. The model also controls for standard firm-level characteristics hypothesized to determine loss estimation. Specifically, we estimate the following model:

$$Error_{i,t} = \beta_1 MLR\ Regulation_{i,t} + \gamma X_{i,t} + \epsilon_{i.t} \quad (1)$$

where $Error_{i,t}$ is firm *i*'s one-year loss reserve error scaled by ultimate incurred losses in year *t*. $MLR\ Regulation_{i,t}$ is an indicator variable equal to one if health insurer *i* writes business in a state with some form of MLR regulation in year *t*.[22] $X_{i,t}$ represents a vector of control variables.

The remaining control variables in the regression are meant to account for both discretionary and non-discretionary determinants of reserve errors (Grace and Leverty 2012). We include a control for firm size to account for larger firms having the resources to employ more actuaries (Aiuppa and Trieschmann 1987). We measure $Size_{i,t}$ as the natural log of firm *i*'s total assets in year *t*. Harrington and Danzon (1994) suggest that firms attempting to grow can understate reserves in an attempt to improve firm growth and hide insolvency risk. We control for this incentive by including $Growth_{i,t}$, which is the percentage change in firm *i*'s net premium revenue from year *t-1* to year *t*.[23]

[22] According to America's Health Insurance Plans' (AHIP) April 2010 report "Thirty-four states … establish MLR guidelines, require the filing or reporting of loss ratio information with state regulators, or impose limitations on administrative expenses for comprehensive, major medical insurance." We use these thirty-four states in our calculation. These states are: Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Missouri, Minnesota, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Utah, Vermont, Virginia, Washington, and West Virginia.

[23] Net premium data is from the "State of Revenue and Expenses" page of the annual statutory health statement.

We also account for differing levels of product diversification. Providing a more diverse array of product offerings can make it more difficult for firms to reserve accurately. We measure $Product\ Herf_{i,t}$ as a Herfindahl Index for firm *i* based on net premium income across eight lines of business in year *t*.[24] As mentioned earlier, Harrington and Danzon (1994) find that firms looking to grow will understate their reserves, and may attempt to hide this under-reserving using reinsurance. Accordingly, we control for reinsurance usage by including $Reinsurance_{i,t}$, which is firm *i*'s reinsurance ceded, divided by the sum of direct premiums written and reinsurance assumed.[25]

We control for two aspects of a firm's ownership structure. First, we control for whether a firm is organized as a mutual or a publicly-owned stock firm. Mutual ownership structures can create different incentives that could impact reserving decisions (e.g., Mayers et al. 1997; Cummins et al. 1999). We include a binary variable, $Mutual_{i,t}$, that is equal to one if firm *i* is organized as a mutual in year *t* and zero otherwise. $Public_{i,t}$ also controls for ownership structure, and is equal to one if firm *i* is a member of a group including at least one publicly traded firm year *t* and zero otherwise.[26] The remaining ownership category, privately-held stock firms, is the most common, and is the omitted category in this regression. The second aspect relating to ownership structure is whether an insurer is under common ownership with other insurers (Shin and Stulz

[24] The data we use to construct *Product Herf* are from the "Analysis of Operations by Lines of Business" page of the annual statutory health statements. The eight lines of business are "Comprehensive (Hospital & Medical)", "Medicare Supplement", "Dental Only", "Vision Only", "Federal Employees Health Benefit Plan", "Title XVIII Medicare", "Title XIX Medicaid", and "Other".

[25] Data on reinsurance premiums comes from the "Underwriting and Investment Exhibit Part 1 – Premiums" page of the annual statutory filings.

[26] We determine whether a group contains a publicly traded firm using group membership data from Schedule Y of an insurer's annual statutory statements. Schedule Y includes information on each insurer's entire ownership structure (including non-insurers). We match Schedule Y to the CRSP database using Federal Employer Identification Numbers, which are the only company identifier contained in insurer statutory filings and the CRSP database. If a match exists, we consider a firm to be publicly traded.

1998).[27] We include a binary variable, $Group_{i,t}$, which is equal to one if firm *i* is a group member in year *t*, and zero otherwise.

Finally, we include a set of variables likely to be associated with income smoothing. Insurers may have an incentive to reduce the variability of their income to make the firm appear less risky to potential shareholders (Froot et al. 1993). Alternatively, insurers could be incentivized to smooth income (and reduce apparent risk) to appeal to regulators (Grace 1990). Beaver et al. (2003) find empirical evidence suggesting that firms manage their reserves to avoid losses and across the entire earnings distribution. Notably, they find evidence that firms with small positive profits tend to under-reserve, suggesting that these firms only managed to avoid a loss by understating their losses. We therefore include a set of three binary variables to control for a firm's earnings in a given year. $Small\ Loss_{i,t}$ is equal to one if firm *i*'s earnings fall in the top five percent of the negative earnings distribution in year *t*, and zero otherwise. $Small\ Profit_{i,t}$ is equal to one if firm *i*'s earnings fall in the bottom five percent of the positive earnings distribution in year *t*, and zero otherwise. $Profit_{i,t}$ is equal to one if firm *i*'s earnings fall in the top 85 percent of the positive earnings distribution in year *t*, and zero otherwise.

Our empirical model of equation (1) employs random effects. (A Hausman specification test suggests that random effects are appropriate for our data, with a p-value>0.10.) To account for autocorrelation and heteroscedasticity in our data, we used feasible generalized least squares. As noted by Grace and Leverty (2012), this allows us to correct standard errors for the panel-

[27] Group membership is common in the health insurance industry. Approximately 80% of our sample firms are affiliated with other firms. One example is Cigna Healthcare Group. In 2011, Cigna Healthcare Group comprised numerous subsidiaries, such as Allegiance Life & Health Insurance Company, Cigna Healthcare of Georgia, and Cigna Healthcare MidAtlantic. Annual statutory statements for health insurers are reported at the individual company level, rather than at the group level.

specific heteroscedasticity and serial correlation present in our data. We also include year fixed effects in each model.

We then augment model (1) to include variables related to external monitoring:

$$Error_{i,t} = \beta_1 MLR\ Regulation_{i,t} + \beta_2 MLR\ Regulation_{i,t} * Big4_{i,t}$$
$$+\beta_3 Big4_{i,t} + \gamma X_{i,t} + \epsilon_{i.t} \quad (2)$$

Prior studies have examined whether high quality external monitoring influences reserving practices (Petroni and Beasley 1996; Gaver and Paterson 2001, 2007; Gaver et al. 2012). Gaver and Paterson (2001) note that, in addition to external monitoring by auditors, insurers are subject to external monitoring by actuaries. Here, $Big4_{i,t}$ is a binary variable equal to one if firm *i* had both a Big 4 auditor and a Big 4 actuarial firm in year *t*, and zero otherwise.[28] Our interest is in the interaction coefficient β_2, which indicates the effect of external monitoring on insurers' reserve error in the states with MLR regulation.[29]

4.2.2. Federal Regulation via ACA Enactment

Our second analysis focuses on the implementation of the ACA. Here, we estimate two models. First, we estimate the model presented above (equation 1), but with indicator variables for: 1) those insurers operating in states without MLR regulation ($No\ MLR_{i,t}$) and 2) the interaction between $No\ MLR_{i,t} * ACA_{i,t}$, where $ACA_{i,t}$ is equal to 1 for event years 2011 and later, when the

[28] Consistent with Gaver and Paterson (2001), we define a Big 4 actuarial firm as one that is affiliated with a Big 4 auditor. Data on a firm's auditor and actuarial firm come from the "General Interrogatories" page of the health annual statutory statements.

[29] We acknowledge that auditor selection is endogenous. However, we are unaware of any suitable variable that would satisfy an exclusion restriction for our model. Specifically, to correctly identify an auditor-choice model, we would need a variable that determines auditor choice, but is plausibly excludable from our reserve error determinants model. Prior studies have used variables that capture firm size or profitability (Weber and Willenborg 2003; Pittman and Fortin 2004; Behn et al. 2008), but neither of these variables is appropriately excludable in our case. Accordingly, we follow the advice of Lennox et al. (2012, pg. 610) and note that "a potential endogeneity problem could affect [this] study's inferences, but it is very difficult to implement a credible selection model."

ACA was in effect. (We do not separately include the $ACA_{i,t}$ indicator because it would be absorbed by the year fixed effects.) Our interest is in the interaction term, which is essentially the differential effect of federal MLR regulation on firms previously covered by state-level MLR regulation relative to firms not previously covered. We expect the federal regulation to lead to a relatively larger increase in reserve errors for insurers not previously covered by MLR regulations (i.e., a positive coefficient on the interaction term).[30]

Next, we examine the degree to which those health insurers whose "true" MLR falls below the MLR threshold overstate their losses. For this analysis, we calculate insurers' true MLRs for a given year by replacing the claims they *actually* reported for that year with the claims they *would have* reported for that year if they had accurately estimated those claims. We then calculate a true MLR using those updated claims numbers, as well as the other components of the MLR detailed in the filing.[31] Finally, we compare the true MLR to the reported threshold for that firm-line-year; we expect that insurers falling below the MLR threshold have a greater incentive to manipulate their reported losses upwards.

Here, because it is less likely that unobservable firm characteristics are uncorrelated with the key independent variables, we use a pooled OLS regression with clustered standard errors. Specifically, we estimate:

$$Error_{i,t} = \beta_1 Below\ MLR_{i,t} + \gamma X_{i,t} + \epsilon_{i,t} \quad (3)$$

The *Below MLR* variable is equal to one if the insurer's true MLR (as calculated based on the description in the Appendix) was below the minimum MLR requirement for that particular line

[30] Our analysis does not represent a true difference-in-differences, as the ACA imposes increased regulatory oversight on insurers from all states, rather than on just a subset of insurers. Our treatment represents the relatively greater effective increase on insurers operating in states without existing state-level MLR regulation. This approach is similar to that taken by Bleakley (2010) in studying the effect of malaria eradication campaigns. In that study, a single, universal intervention is hypothesized to have differential impact on regions based on the pre-treatment status of those regions.

[31] The Appendix describes and illustrates this calculation in greater detail.

of business. A positive β_1 coefficient would indicate over-reserving by firms who, under perfect foresight reporting, would be required to pay a policyholder rebate, and would be consistent with our hypothesis that firms will attempt to avoid the effects of regulation through reporting management.

5. Results

5.1. Summary Statistics

We report summary statistics for our sample firms in Table 3, with detailed statistics about the reserve error in Table 4. The average reserve error for firms in our sample is 0.0051, indicating industry-wide average over-reserving. Approximately 75 percent of firm year observations have positive reserve errors, which is consistent with studies examining reserving practices of property-casualty insurers, where the majority of firms over-reserve (e.g., Grace and Leverty 2010). The median reserve error is positive in every year of our sample, while the mean error is positive in every year but 2012. 68 percent of firm-years in our sample occur in states with some form of MLR regulation in the pre-ACA period.

Table 5 provides correlations between our variables. The correlation between reserve errors ($Error_{i,t}$) and whether the insurer is operating in a state with MLR regulation ($MLR\ Regulation_{i,t}$) is positive for both Pearson and Spearman correlations. While this provides some preliminary support for our hypotheses of over-reserving in response to MLR regulation, it is important to consider other discretionary and non-discretionary determinants of reserve errors to isolate any potential impact of MLR regulation.

5.2. Results: State-Level Regulation

Results from our estimation of equation (1) are presented in Table 6. The dependent variable in both specifications is $Error_{i,t,}$ which is firm *i*'s one-year loss reserve error scaled by ultimate incurred claims in year *t*. The results in column (1) show the standard determinants of reserve error, while column (2) includes our variable of interest, $MLR\ Regulation_{i,t}$. Positive coefficient estimates indicate over-reserving, while negative coefficients indicate under-reserving. Standard errors are presented beneath each coefficient estimate and account for autocorrelation and heteroskedasticity.

The estimated coefficient on $MLR\ Regulation_{i,t}$ is positive and significant in column (2), indicating that firms operating in states with some form of MLR regulation in the pre-ACA period tended to over-reserve relative to firms operating in states without any MLR regulation. The magnitude of this effect is economically large, representing 29% (0.0015/0.0051) of the mean signed error and 8% (0.0015/0.0191) of the mean absolute error in the pre-ACA period. The results for the remaining control variables provide evidence of reserve management related to incentives other than MLR regulation. Specifically, the estimated coefficient on $Size_{i,t}$ is positive and significant, consistent with results in prior studies in the property-casualty area. *Growth* is positively associated with over-reserving. Affiliated health insurers tend to over-reserve relative to unaffiliated firms, as evidenced by the positive coefficient on our indicator variable $Group_{i,t}$. Finally, we find evidence of earnings smoothing behavior for health insurers. The negative and statistically significant coefficient estimate on $Small\ Profit_{i,t}$ provides evidence that firms under-reserve in order to avoid losses, consistent with prior empirical work (e.g., Beaver et al. 2003).

5.3. Results: External Monitoring

We next examine how external monitoring affects reserving behavior in the pre-ACA period. We show the results of estimating equation (2) in Table 7. Similar to the prior table, the dependent variable is $Error_{i,t}$ - firm *i*'s one-year loss reserve error scaled by ultimate incurred claims in year *t*. There are two differences between this table and the prior table. First is the inclusion of the Big 4 monitoring effect, $Big\ 4_{i,t}$, and its interaction with $MLR\ Regulation_{i,t}$. The second difference is that, because the firm's auditor and actuary are only available for a subset of our full sample, the sample used in this analysis is substantially smaller than that in the prior analysis. We report column (1), which mirrors the regression in Table 6, to ensure that the results shown in Table 6 carry over to this smaller sample. The estimated coefficient on $MLR\ Regulation_{i,t}$ continues to be positive and significant, with comparable magnitude (0.0015 in Table 6 compared to 0.0017 for the reduced sample in Table 7).

Column (2) includes our Big 4 monitoring variables. Our focus is on the interaction of $Big\ 4_{i,t}$ with $MLR\ Regulation_{i,t}$, which indicates whether external monitoring limits the ability of firms to manage reserves in response to MLR regulation. The estimated coefficient on this variable is negative and significant, indicating that Big 4 auditors and actuaries are effective in limiting firms' over-reserving. In fact, the effect is large enough to completely offset the average over-reserving effect shown here and in Table 6; using a Wald test, we cannot reject the null hypothesis that $MLR\ Regulation_{i,t}$ plus $MLR\ Regulation_{i,t}*Big\ 4_{i,t}$ is equal to zero (p-value = 0.10). This result is consistent with prior literature that documents the ability of external monitoring to influence insurer reserving practices (Gaver and Paterson 2001).

5.4. Results: ACA Implementation of Federal MLR Requirements

Our next analysis focuses on the change in reserving behavior from before to after ACA enactment. Rather than a simple changes model, our analysis is analogous to a difference-in-difference analysis based on the variation in state-level MLR regulation prior to the ACA. The goal of this specification is to isolate the change in reserving that was due to the implementation of the ACA's MLR regulation, while controlling for other contemporaneous factors. (For example, the ACA's enactment coincides with the end of the financial crisis, which would contaminate a simple changes model.) In our setting, we expect the ACA's MLR regulation to have little impact on firms that were already subject to MLR regulation at the state level.

Table 8 shows our results, again based on a feasible generalized least squares model with random effects. (A Hausman specification test suggests that random effects are appropriate for our data, with a p-value>0.10.) Once again, the dependent variable is $Error_{i,t}$. The "treatment" variable in this regression is $No\ MLR_{i,t}$, which equals one if the firm was *not* subject to state-level MLR regulation prior to the passage of the ACA (i.e., would be most affected by the ACA). Our interest is in the interaction term $No\ MLR_{i,t}*ACA_{i,t}$, which isolates the impact of the ACA on those firms most likely to be affected. Column (1) includes only the two binary variables and their interaction, while Column (2) includes the full set of control variables used in Table 6.

The results in both columns are consistent with our hypothesis that MLR regulation is associated with over-reserving. In particular, the coefficient estimate on the interaction term $No\ MLR_{i,t}*ACA_{i,t}$ is positive and significant in both specifications. In fact, the magnitude of the ACA effect (0.0015 in Column 1 and 0.0013 in Column 2) is approximately as large as the pre-ACA effect documented in Table 6 (0.0015). In untabulated results, we find no evidence that Big 4 actuaries/accountants are associated with the effect of the ACA.

These results, combined with the results described earlier, indicate that both state-level and federal-level MLR regulation affects firms' reserving practices. In effect, the ACA seems to have closed the gap between firms that had previously been governed by state-level MLR regulation and unregulated firms; following the ACA's enactment, *all* firms have an incentive to over-reserve in response to MLR regulation. In the next section, we further examine potential reporting management in the post-ACA period.

5.5. Results: Earnings Management in the Post-ACA Period

The ACA clearly describes insurers' MLR benchmarks and the consequences for failing to meet them. Our post-ACA analysis is based on the straightforward observation that insurers have a financial incentive to overstate their reported claims in situations where their true (i.e., not manipulated) MLRs are lower than the ACA-specified benchmarks: Increasing reported claims leads to higher MLRs and therefore lower required rebate payments to policyholders.

We start with graphical evidence of firms' reported MLRs in the post-ACA period. Figure 5 shows histograms of reported MLRs for 2014. We separately show the distribution of MLRs for each type of policy – individual, small group, and large group. The red vertical lines represent the minimum requirement in each group – 80% for individual and small group plans, and 85% for large group plans. In each of the three lines, we observe a discontinuity around that minimum requirement, with firms clustered at or immediately above the threshold. Similar to other earnings management studies (e.g., Burgstahler and Dichev 1997), this pattern provides preliminary evidence that insurers could be manipulating their reported claims numbers. Of course, an alternative explanation is that firms are shifting their actual policyholder expenditures to comply with the ACA's MLR requirements.

We distinguish between these two possible explanations by examining the errors in insurers' reported claim estimates. If insurers' estimated claims are unbiased, we expect the claims error to be unrelated to their reporting incentives. On the other hand, if firms' claims estimates are influenced by their ACA-related reporting incentives, we expect to observe more over-reserving by firms whose true MLR is below the ACA's threshold. For this analysis, we take advantage of the fact that we not only observe what firms *did* report, but we can also calculate what firms *would have* reported based on more accurate estimates. This calculation is described in detail in the Appendix using Aetna Connecticut's 2012 filing as an example.

To summarize, Aetna Connecticut originally reported a 78.1% MLR for their individual line, resulting in a policyholder rebate of $1,094,626.[32] Had they made more accurate estimates for the 2011 and 2012 years (as determined by updated estimates provided in the following year's filing), Aetna *would have* reported a 77.7% MLR and a $1,325,074 policyholder rebate. We refer to these latter figures as the "true" MLR and the "true" rebate, and we interpret these calculated values as what the firm would have reported in the absence of manipulation.

Our interest is in how firms' reported MLRs differ from their true MLRs. Table 9 provides descriptive statistics, by line of business. Panel A shows the combination of all 3 lines of business, while Panels B through D show the 3 lines individually. In each case, the table shows the percentage of firm-line-years (e.g., Aetna Connecticut's 2012 individual market) for which the reported MLR was understated, overstated, or equal to the true MLR, partitioned by whether or not he firm-line-year's true MLR was below the ACA threshold. The relatively low percentage of MLRs in the "% Same Claims" category indicates the extent to which accurate estimation is difficult in the setting – only 9.9% of reported MLRs are equal to the "true" MLR.

[32] The 78.1% reported MLR was less than the 80% threshold for policies in the individual market. The firm reported $57,611,912 in adjusted premiums, resulting in a rebate of (80% - 78.1%) * $57,611,912 = $1,094,626.

More importantly for our purposes, Table 9 illustrates an obvious asymmetry in firms' reported MLR figures. When firms' true MLRs are below the threshold, they are substantially more likely to subsequently revise their estimated claims downwards. In other words, firms below the threshold are more likely to overstate their reported claims than firms above the threshold. For the combined sample, firm-line-years that were above the threshold were slightly more likely to overstate their claims than to understate their claims (48.8% overstated vs. 40.0% understated, or a 1.22 overstated/understated ratio). For the firm-line-years below the threshold, facing an incentive to manipulate their reported MLRs upwards, the asymmetry increases substantially to 63.7% overstating their claims compared to 31.2% understating their claims, or a 2.04 ratio. That pattern is evident in all 3 lines of business: The individual market (Panel B) has an overstate/understate ratio of 2.38 for firms below the threshold compared to 1.43 for firms at or above the threshold; the small group market (Panel C) has an overstate/understate ratio of 1.76 for firms below the threshold compared to 1.23 for firms at or above the threshold; and the large group market (Panel D) has an overstate/understate ratio of 1.88 for firms below the threshold compared to 1.07 for firms at or above the threshold.

We next conduct a more formal analysis of firms' claims errors as a function of their true MLR being above or below the threshold. Table 10 presents the results of an OLS regression where the dependent variable is equal to the claims error scaled by ultimate incurred claims for that line that year.[33] Our independent variable of interest is *Below* $MLR_{i,t}$, which is an indicator variable equal to 1 when the true MLR for a given firm-line-year is below the specified threshold for that firm-line-year, and 0 otherwise. As in earlier regressions, this regression controls for other factors influencing firms' reported claims errors. In Panel A, we estimate an average effect of the

[33] Unlike our earlier analyses, a Hausman specification test suggests that random effects are inappropriate for our data, with a p-value<0.01.)

MLR threshold across all lines of business with the *Below MLR*$_{i,t}$ variable, while in Panel B we let the effect of the MLR threshold vary across the 3 lines of business. Each regression includes year and line of business fixed effects.

Column (1) of Panel A shows that firms whose true MLRs are below the threshold significantly overstate their reported claims. In particular, we document a relative overstatement of 0.7% of claims compared to firms at or above the threshold. This relative overstatement is consistent with managers responding to the financial incentive created by the ACA's minimum MLR provision. In Column (2), we add controls for *Big 4*$_{i,t}$, as well as an interactive effect with *Below MLR*, but find no evidence that Big 4 auditors and actuaries affect overstated claims by firms below the threshold. Column (3) includes the full set of control variables, and the inferences from Columns (1) and (2) remain unchanged.

In Panel B, we allow the incentive effect of *Below MLR*$_{i,t}$ to vary across the 3 lines of business. We find significant coefficients on the *Below MLR*$_{i,t}$ variable for each line, ranging from 0.4% of ultimate claims for the large group market to 1.3% for the individual market in Column (1). The coefficient estimates for the individual and large group markets are statistically significant at the $p<0.01$ level, while the coefficient estimate for the small group market is significant at the $p<0.10$ level. Those results continue to hold in Column (2), where we include the full set of control variables.[34] Overall, the results in Panels A and B provide evidence that managers respond to the ACA's minimum MLR provision by significantly overstating their estimated claims numbers, and do so across all 3 lines of business. We find no evidence that Big 4 auditors or actuaries influence this practice.

[34] For brevity, we omit the Big 4 main effect and the interactive effects of Big 4 with each *Below MLR*$_{i,t}$ variable. Those effects are uniformly statistically insignificant.

5.6. Results: Effect on Policyholder Rebates

The data made available through ACA filings on the CMS website allows us to not only quantify insurers' claims errors, but also quantify how those errors affect the rebates insurers ultimately pay out to policyholders. Following the process described in the Appendix, we recalculate insurers' rebate amounts for each line and each year under the assumption that they had reported more accurate claims data than what they originally reported. If firms systematically manipulated their reported claims amounts to avoid rebate payments, we expect their true rebates to be higher than their reported rebates. Table 11 provides summary information for the aggregated sample (Panel A), as well as each line of business (Panels B through D), by year.

At the aggregate level, insurers' claims errors led to lower policyholder rebates in each of the 5 years for which we have data, ranging from 5.4% to 12.6% of the originally reported rebate amounts. Panels B through D show the same degree of consistency – insurers reported lower policyholder rebates than they would have under unbiased reporting in 14 out of 15 line-years. The most extreme consequence is in the individual market, where insurers reported aggregate rebates of $841,750,655, but would have owed an additional $110,495,752 (13.1% more) if they had reported what we refer to as their true claims amounts. This is particular notable since the individual market was the line viewed as most in need of regulatory assistance, and the line experiencing the greatest increase in reported MLRs.

Taken together, the post-ACA analyses strongly suggest that the ACA's MLR threshold influenced firms' claims estimates. Insurers whose true MLRs were below the threshold were

significantly more likely to overstate their claims. This overstatement, in turn, led to insurers paying out approximately 10% less than they should have in policyholder rebates.[35]

5.7. Robustness Test – P&C Insurers in the Pre-ACA Period

One potential concern with our pre-ACA results is the possibility that they are driven by differences between the states that are not related to MLR regulation. In order to test whether this is the case, we perform a falsification test using the property-casualty (P/C) insurance industry. The P/C insurance industry is a closely related industry to the health insurance industry, and insurers in the industry report the same loss reserve development. However, P/C insurers are not subject to MLR regulation. Accordingly we estimate both the pre-ACA regression (Table 6) and the difference-in-differences regression (Table 8) with a combined sample of health insurers and P/C insurers.

Because P/C insurers operate across state lines without forming separate entities, we identify their location in two ways. First, we allow all P/C insurers into our sample and treat *MLR Regulation*$_{i,t}$ as a percentage based on how much business the firm writes in each state. Second, we restrict the sample to firms that operate exclusively in or out of states with MLR Regulation (i.e., *MLR Regulation*$_{i,t}$ equals one or zero). We then perform the same analyses on the P/C insurers that we performed for the health insurers in our sample. In untabulated results, we find that P/C firms operating in states with MLR regulation in the pre-ACA period tend to *under-reserve* relative to P/C firms outside of those states. This relation is opposite the result we document in Table 6. For our pre- to post-ACA comparison, we find no statistical association between P/C insurers

[35] We note that if reported MLRs influenced premium increase approvals, as prior research and some of our conversations have suggested, the rebate underpayment represents the floor of insurer benefits from overstating their estimated claims.

operating in MLR states and their change in reserve errors around the ACA. (That is, unlike in Table 8, the *No MLR*ACA*$_{i,t}$ interaction variable is not statistically significant.) We interpret this set of results as evidence that our empirical tests on health insurers are accurately capturing the influence of MLR regulation and not another state-specific confounding factor.

6. Conclusion

Regulation can create incentives for firms to use accounting discretion to avoid costs imposed by that regulation. In this study, we examine the incentives created by medical loss ratio regulation in the U.S. health insurance industry. We exploit variation in state implementation of MLR regulation in the pre-ACA period to examine whether firms over-state loss estimates to meet minimum MLR requirements. We then examine changes in loss reserves surrounding the implementation of minimum MLR requirements at the federal level by the ACA. Finally, we use granular data from insurers' ACA-mandated filings to examine firms' estimation errors as a function of their incentives to manipulate their loss ratios, and quantify the effect of those errors on policyholder rebates.

Overall, we find consistent evidence that insurers over-reserved loss estimates when facing MLR regulation at both the state and federal levels. Additionally, we find that firms whose true MLRs fell short of the ACA's threshold consistently overstated their reported claims in the post-ACA period. This overstatement led to insurers underreporting rebates owed to policyholder by approximately 10%. Finally, we find evidence (albeit only in the pre-ACA period) that Big 4 auditors and actuaries limit the ability of insurers to engage in aggressive reporting for MLR purposes. Our study indicates the extent to which even non-financially oriented regulations can

influence firms' financial reporting, and they raise a warning for policymakers, analysts, and researchers who take firms' regulatory reports and metrics at face value.

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Appendix
Calculation of true MLRs and rebates owed

We use data from Aetna Life Insurance Company's Connecticut filing (Issuer ID: 39159) to examine MLR reporting in 2012 in this example. In this example, we focus on their "Individual" line of business reporting, though the calculation is the same for any line of business with the necessary data. In their 2012 filing, Aetna originally reported an MLR of 78.1%, compared to a benchmark of 80%. As a result, they had to pay $1,094,626 in rebates:

5.	Rebate Calculation		
5.1	MLR standard		80.0%
5.2	Credibility-adjusted MLR (Line 4.3)		78.1%
5.3	Adjusted earned premium less Federal and State taxes and licensing or regulatory fees ((Line 2.3, column CY only)		$ 57,611,912
5.4	**Rebate amount if credibility-adjusted MLR is less than MLR standard (Lines (5.1 - 5.2) X 5.3)**		$ 1,094,626

We would calculate Aetna's 2012 true MLR and rebates owed as follows:

1. In the 2012 Filing, we use data from the "Pt 4 MLR and Rebate Calculations" worksheet and collect the adjusted incurred claims actually used in the MLR calculation in 2012. Specifically, we are interested in Line 1.2, PY1 and Line 1.2 CY. These numbers for our example firm are outlined in red in the figure below:

Part 4 NOTE: REFER TO MLR INSTRUCTIONS, FORMULAS RESOURCE AND TABLES RESOURCE FOR IMPORTANT INFORMATION ABOUT COMPLETING EACH COLUMN AND ROW.		PY2	PY1	CY	Total
		1	2	3	4
1.	Medical Loss Ratio Numerator				
1.1	Adjusted incurred claims as reported on MLR Form for prior year(s)		$ 30,708,260		
1.2	Adjusted incurred claims as of 3/31 of the year following the MLR reporting year		$ 30,922,010	$ 43,049,881	$ 73,971,891
1.3	Quality improvement expenses		$ 274,749	$ 499,477	$ 774,225
1.4	MLR rebates paid based on 2011 or 2012 experience		$ 2,102,655		$ 2,102,655
1.5	MLR numerator				$ 76,848,771
1.6	MLR numerator "Mini-Med" and Expatriate (MLR numerator x adjustment factor)				

In this case, we have $30,922,010 and $40,049,991 as the originally reported adjusted incurred claims to be used in the 2012 MLR calculation. (In the first year of reporting, insurers used a single year of claims data in the MLR calculation. In the second

year of reporting, as in this example, insurers used two years of claims data. In all subsequent years, insurers calculated their MLRs based on the most recent three years of premiums and claims.)

2. Next, we acquire the 2013 MLR filing to acquire the updated adjusted incurred claims, based on an additional year of loss development. Here, we use the values reported in in Line 1.2 PY2 and Line 1.2 PY1 from the "Pt 4 MLR and Rebate Calculation" worksheet, outlined in red in the figure below:

Part 4 NOTE: REFER TO MLR INSTRUCTIONS, FORMULAS RESOURCE AND TABLES RESOURCE FOR IMPORTANT INFORMATION ABOUT COMPLETING EACH COLUMN AND ROW.			PY2	PY1	CY	Total
			1	2	3	4
1.		Medical Loss Ratio Numerator				
	1.1	Adjusted incurred claims as reported on MLR Form for prior year(s)	$ 30,798,260	$ 43,049,881		
	1.2	Adjusted incurred claims as of 3/31 of the year following the MLR reporting year	$ 30,381,587	$ 43,128,985	$ 72,652,915	$ 146,163,487
	1.3	Improving Health Care Quality Expenses	$ 274,749	$ 499,477	$ 848,466	$ 1,622,692
	1.4	MLR rebates paid based on 2011 or 2012 experience	$ 2,102,655	$ 1,094,627		$ 3,197,281
	1.5	MLR numerator	$ 30,656,336	$ 43,628,462	$ 73,501,381	$ 150,983,460
	1.6	MLR numerator Mini-Med and Student Health (using adjustment factor).				

In this case, the estimated claims for 2011 and 2012 (as of the 2013 filing) have been updated to $30,381,587 and $43,128,985, respectively.

3. Using the figures from the 2012 and 2013 filings, we calculate the degree to which the 2012 filing data was accurate relative to the updated 2013 filing data covering the same event years. In this case, the combined 2011 and 2012 claims evolved from a 2012 estimate of 30,922,010+43,049,881=73,971,891 to an updated 2013 estimate of 30,381,587+43,128,985=73,510,572. This calculation indicates that in the 2012 filing, Aetna's incurred claims estimates were $73,971,891 - $73,510,572 = $461,319 higher than updated estimate a year later.

4. We then use this information to calculate what the firm's MLR would have been if they had perfectly forecast incurred claims at the time of the 2012 filing, and refer to this number as the "true" MLR. Specifically, we replace the claims data originally reported in the 2012 filing with the updated claims data reported in the 2013 filing. Replacing these numbers changes Line 1.2

Total (since it is just the sum of Line 1.2, PY1 and Line 1.2 CY) and Line 1.5 Total (since it is the sum of the numbers above it). The end results of these changes are contained in the following figure and boxed in red, including the MLR numerator:

Part 4 NOTE: REFER TO MLR INSTRUCTIONS, FORMULAS RESOURCE AND TABLES			PY2	PY1	CY	Total
			1	2	3	4
1.	Medical Loss Ratio Numerator					
	1.1	Adjusted incurred claims as reported on MLR Form for prior year(s)		$30,798,260		
	1.2	Adjusted incurred claims as of 3/31 of the year following the MLR reporting year		$30,381,587	$43,128,985	$73,510,572
	1.3	Quality improvement expenses		$ 274,749	$ 499,477	$ 774,225
	1.4	MLR rebates paid based on 2011 or 2012 experience		$ 2,102,655		$ 2,102,655
	1.5	MLR numerator				$76,387,452
	1.6	MLR numerator "Mini-Med" and Expatriate (MLR numerator x adjustment factor)				

5. We continue the MLR calculation using the denominator information (earned premiums) originally reported in the 2012 filing (Part 2 of the worksheet). The data are provided in the figure below:

2.		Medical Loss Ratio Denominator				
	2.1	Premium earned including Federal and State high risk programs	$ 46,280,665	$ 62,091,776	$ 108,372,441
	2.2	Federal and State taxes and licensing or regulatory fees	$ 3,368,741	$ 4,479,864	$ 7,848,605
	2.3	MLR Denominator (Line 2.1 - Line 2.2)			$ 100,523,836

6. To complete the MLR calculation, we obtain the credibility adjustment originally reported in the 2012 filing (Part 3 of the worksheet):

3.		Credibility Adjustment			
	3.1	Life Years to determine credibility	17,284	24,556	41,840
	3.2	Base credibility factor			1.3%
	3.3	Average deductible			$ 3,646
	3.4	Deductible factor			1.273
	3.5	Credibility adjustment (Lines 3.2 x 3.4 (do not round))			1.7%

7. The final MLR calculation divides total claims from part 1 by the denominator in part 2 to calculate a preliminary MLR of 76,387,452/100,523,836 = 76.0%, and then applies the credibility adjustment from line 3.5 to obtain the "Credibility-adjusted MLR" (line 4.3) of 77.7%:

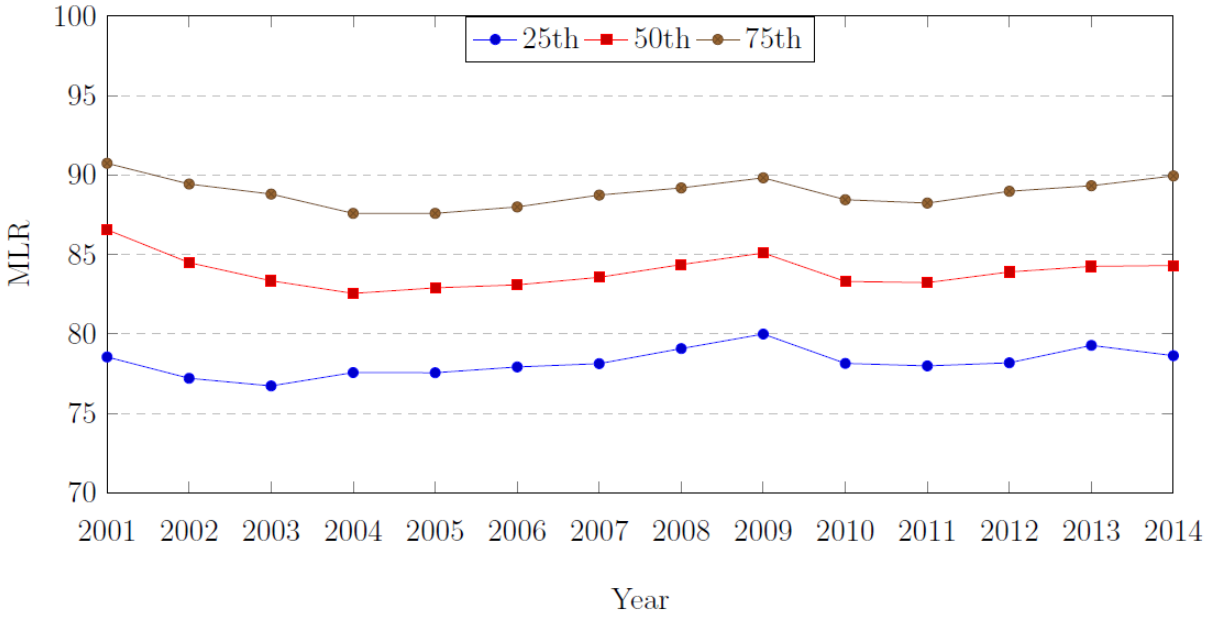
4.	MLR Calculation (for issuers with at least 1,000 life years in the Total column of					
	4.1	Preliminary MLR				
		4.1a Preliminary MLR (Lines 1.5 / 2.3)				76.0%
		4.1b Preliminary MLR: "Mini-Med" and Expatriate (Lines 1.6 / 2.3)				
	4.2	Credibility adjustment (Line 3.5, if applicable)				1.7%
	4.3	**Credibility-adjusted MLR (Lines 4.1a or 4.1b + 4.2)**				77.7%

8. Finally, we compare the Credibility-adjusted MLR, as calculated above in Line 4.3, and determine whether the firm would have met the minimum MLR requirement if they had reported this amount in their original filing. In this case, because Aetna's "true" MLR was 77.7% and their benchmark was 80%, we would classify Aetna's true MLR as below the threshold. We then calculate Aetna's true rebate owed as the difference between their true MLR and the benchmark, multiplied by their 2012 premiums:

5.	Rebate Calculation					
	5.1	MLR standard				80.0%
	5.2	Credibility-adjusted MLR (Line 4.3)				77.7%
	5.3	Adjusted earned premium less Federal and State taxes and licensing or regulatory fees ((Line 2.3, column CY only)				$ 57,611,912
	5.4	**Rebate amount if credibility-adjusted MLR is less than MLR standard (Lines (5.1 - 5.2) X 5.3)**				$1,325,073.98

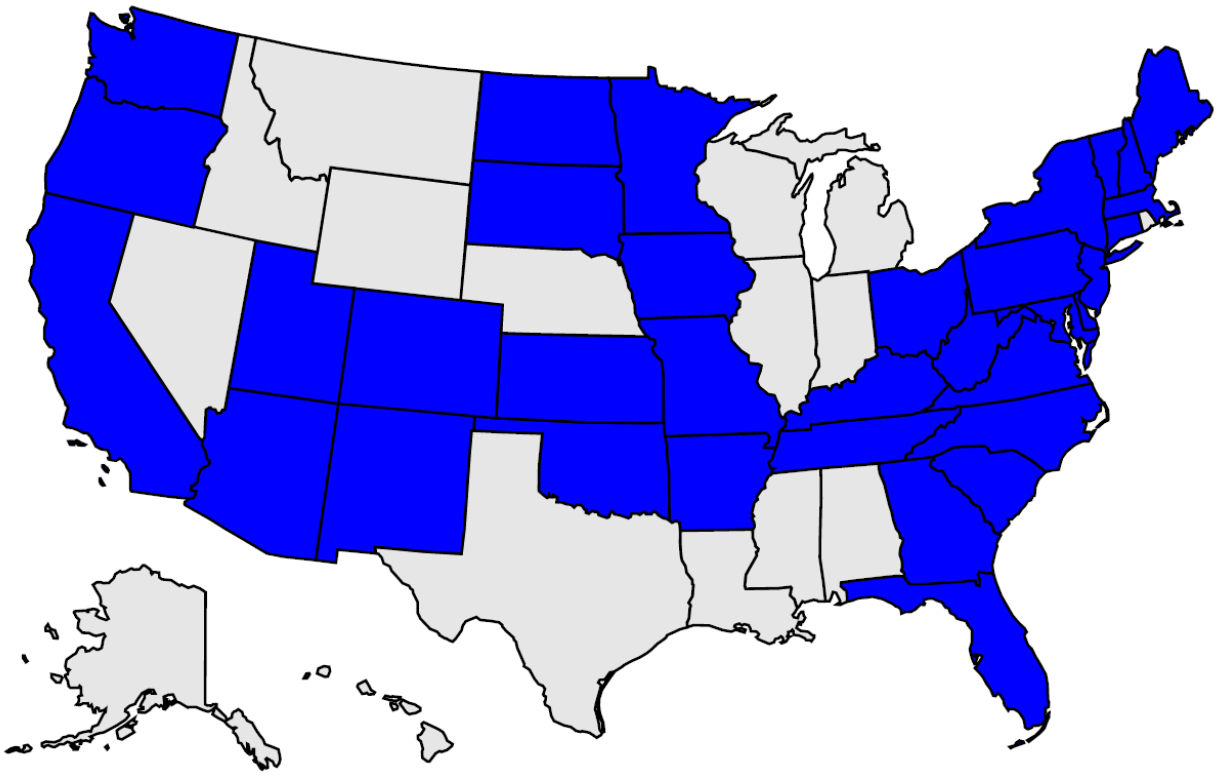
Thus, we would say that Aetna reported a 2012 rebate amount of $1,094,626, but would have owed $1,325,074 if they had perfectly estimated their incurred claims in 2012. That difference in reported claims represents an underpayment of $230,448 in policyholder rebates.

Figure 1
Industry MLR by Year



This figure reports medical loss ratios by year for the health insurance industry. The brown (top) line represents the 75th percentile, the red (middle) line represents the 50th percentile, and the blue (bottom) line represents the 25th percentile. Data are from the entire health insurance industry from 2001 to 2014. The medical loss ratio is defined as total hospital and medical claims less reinsurance recoveries as a percentage of net premium income. Note that this is not the medical loss ratio definition used under the ACA's medical loss ratio regulation, as data necessary to calculate that medical loss ratio are not available until 2011.

Figure 2
MLR Regulation by State in the Pre-ACA Period



This figure illustrates each state's medical loss ratio regulatory status in the pre-ACA period. States shaded in blue had some form of MLR regulation prior to the ACA (i.e., pre-2011) while states in grey had no MLR regulation prior to the passage of the ACA.

Figure 3
Illustration of Reserve Error Calculation for Pre-ACA Calculations

Section B--Incurred Health Claims

	Sum of Cumulative Net Amount Paid and Claim Liability, Claim Reserve and Medical Incentive Pool and Bonuses Outsanding At End of Year				
Year in Which Losses Were Incurred	1 2008	2 2009	3 2010	4 2011	5 2012
Prior	1,312,671	1,312,286	1,312,135	1,311,579	1,311,427
2008	229,370	248,352	248,250	248,207	248,177
2009	XXX	221,790	238,638	238,226	238,195
2010	XXX	XXX	242,083	275,333	274,699
2011	XXX	XXX	XXX	214,176	301,767
2012	XXX	XXX	XXX	XXX	246,636

This table is an excerpt from the National Association of Health Insurance Commissioner's annual statutory filing for Coventry Health Care of IL Inc. (NAIC #74160) for the year 2012.

Total estimated incurred claims through 2011, estimated as of 12/31/2011:

$2,287,521

Total estimated incurred claims through 2011, estimated as of 12/31/2012:

$2,374,265

12/31/2011 reserve error:

$2,287,521 - $2,374,265

= $86,744 under-reserve

Figure 4
Illustration of Claims Error Calculation for Post-ACA Calculation

2012 Filing:

Part 4 NOTE: REFER TO MLR INSTRUCTIONS, FORMULAS RESOURCE AND TABLES RESOURCE FOR IMPORTANT INFORMATION ABOUT COMPLETING EACH COLUMN AND ROW.		PY2	PY1	CY	Total
		1	2	3	4
1.	Medical Loss Ratio Numerator				
1.1	Adjusted incurred claims as reported on MLR Form for prior year(s)		$ 30,798,260		
1.2	Adjusted incurred claims as of 3/31 of the year following the MLR reporting year		$ 30,922,010	$ 43,049,881	$ 73,971,891
1.3	Quality improvement expenses		$ 274,749	$ 499,477	$ 774,225
1.4	MLR rebates paid based on 2011 or 2012 experience		$ 2,102,655		$ 2,102,655
1.5	MLR numerator				$ 76,848,771
1.6	MLR numerator "Mini-Med" and Expatriate (MLR numerator x adjustment factor)				

Estimates as of 2012 filing:
2011 estimated claims: $30,922,010
2012 estimated claims: $43,049,881

2013 Filing:

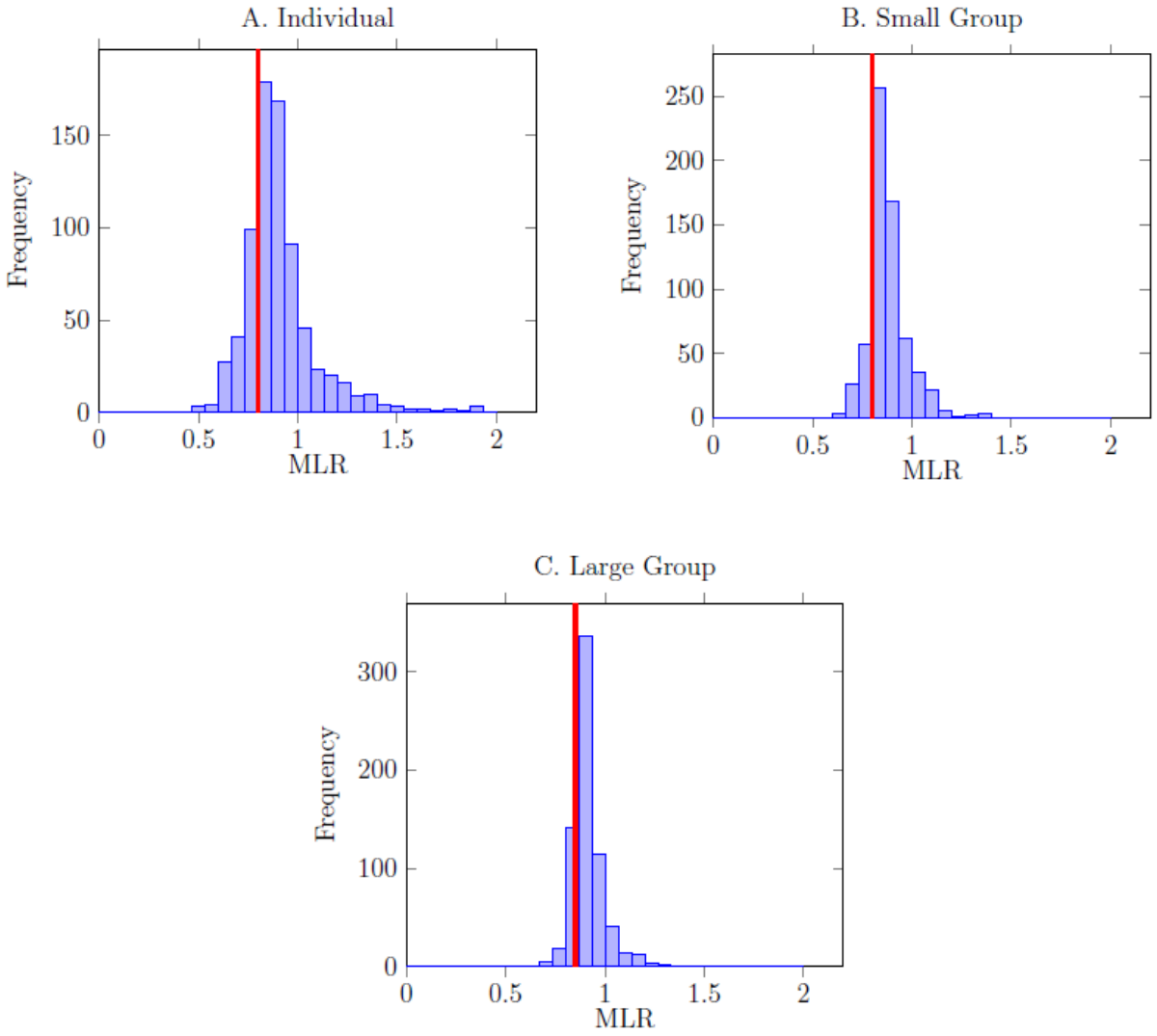
Part 4 NOTE: REFER TO MLR INSTRUCTIONS, FORMULAS RESOURCE AND TABLES RESOURCE FOR IMPORTANT INFORMATION ABOUT COMPLETING EACH COLUMN AND ROW.		PY2	PY1	CY	Total
		1	2	3	4
1.	Medical Loss Ratio Numerator				
1.1	Adjusted incurred claims as reported on MLR Form for prior year(s)	$ 30,798,260	$ 43,049,881		
1.2	Adjusted incurred claims as of 3/31 of the year following the MLR reporting year	$ 30,381,587	$ 43,128,985	$ 72,652,915	$ 146,163,487
1.3	Improving Health Care Quality Expenses	$ 274,749	$ 499,477	$ 848,466	$ 1,622,692
1.4	MLR rebates paid based on 2011 or 2012 experience	$ 2,102,655	$ 1,094,627		$ 3,197,281
1.5	MLR numerator	$ 30,656,336	$ 43,628,462	$ 73,501,381	$ 150,983,460
1.6	MLR numerator Mini-Med and Student Health (using adjustment factor).				

Estimates as of 2013 filing:
2011 estimated claims: $30,381,587
2012 estimated claims: $43,128,985

2012 Claims Error:
(30,922,010 + 43,049,881)
- (30,381,587 + 43,128,985) =
$461,319 over-estimate

This data is copied from Aetna Life Insurance Company's Connecticut filing for 2012 and 2013, obtained from the Centers for Medicare & Medicaid Services website (www.cms.gov).

Figure 5
Medical Loss Ratio Distribution for the 2014 Claims Year



This figure illustrates the distribution of reported medical loss ratios for health insurers in 2014, based on the ACA's definition of the ratio. Panel A reports results for individual policies, Panel B reports results for small group policies, and Panel C. reports results for large group policies. The vertical red line represents the minimum requirement for each line—80% for individual and small group and 85% for large group.

Table 1
MLR Rebates Paid

Claims Year	Individual Market	Large Group	Small Group	Total Rebates
2011	262,988,841	329,659,523	185,153,299	777,801,662
2012	147,110,076	93,705,445	116,609,319	357,424,840
2013	112,479,284	71,339,659	102,054,896	285,873,840
2014	226,289,540	88,324,086	139,929,684	454,543,310
2015	92,882,914	86,914,436	149,902,944	329,700,294
Total	**841,750,655**	**669,943,149**	**693,650,142**	**2,205,343,946**

This table reports total rebates for health insurers for claim years 2011 to 2015. These numbers are from author calculations based on data from the Centers for Medicare & Medicaid Services website (www.cms.gov), for those firms for which we have detailed ACA reporting information. The rebates represented in this table make up approximately 80% of the total rebates owed by all insurers under the ACA for these years.

Table 2
Payout pattern for loss disbursements

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	All Years
t_0	87.3%	88.7%	88.6%	89.7%	88.6%	88.8%	88.8%	89.2%	90.6%	90.6%	88.9%
t_1	97.5%	98.3%	99.0%	99.1%	98.7%	98.9%	98.8%	98.5%	99.1%	99.6%	98.7%
t_2	98.0%	99.6%	99.5%	99.8%	99.2%	99.2%	99.4%	99.7%	99.7%	99.7%	99.3%
t_3	99.5%	99.8%	99.8%	99.7%	99.5%	99.4%	99.6%	99.6%	100.0%	99.8%	99.3%

This table reports the percentage of ultimate losses for a given claims year ($t_{0)}$ paid as of year t_n relative to that claim year. We use data from the Underwriting and Investment Exhibit Section 2 Part A which reports the development of paid claims. These data are divided by ultimate claims reported in Part B to construct a paid-to-incurred ratio for 2001 to 2010.

Table 3
Descriptive Statistics

				Percentiles					
Variable	Mean	Std.	Min	10th	25th	50th	75th	90th	Max
Error	0.0051	0.0595	-0.5000	-0.0102	0.0000	0.0023	0.0064	0.0164	0.4998
MLR Regulation	0.6845	0.4648	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000
Big 4	0.0887	0.2843	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Size	17.6780	2.0321	10.9801	14.8673	16.3583	17.8306	19.1046	20.2149	22.7905
Growth	0.2376	1.1199	-0.9708	-0.1870	-0.0418	0.0521	0.1618	0.4660	9.5104
Product Herf	0.8250	0.2196	0.2276	0.4824	0.6164	0.9843	1.0000	1.0000	1.0000
Reinsurance	0.0181	0.0845	0.0000	0.0000	0.0000	0.0011	0.0071	0.0194	0.9001
Mutual	0.0280	0.1648	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Public	0.2659	0.4418	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000
Group	0.8020	0.3985	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Small Loss	0.0096	0.0975	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Small Profit	0.0204	0.1413	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
Profit	0.7082	0.4546	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000

This table reports descriptive statistics for the years 2003 to 2015. *Error* is the one-year loss reserve error scaled by revised estimated incurred claims. *MLR Regulation* is a binary variable equal to 1 if a firm operated in a state with MLR regulation (pre-ACA) and 0 otherwise. *Big 4* is a binary variable equal to 1 if a firm has both a Big 4 audit firm and a Big 4 actuary. *Size* is the natural log of total assets. *Growth* is the one-year percent change in premiums written. *Product Herf* is a line-of-business Herfindahl index. *Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Mutual* is a binary variable equal to 1 if a firm is organized as a mutual and 0 otherwise. *Public* is a binary variable equal to 1 if a firm is publicly traded and 0 otherwise. *Small Loss* is a binary variable equal to 1 if a firm is in the top 5 percent of the negative earnings distribution and 0 otherwise. *Small Profit* is a binary variable equal to 1 if a firm has earnings in the bottom 5 percent of the positive earnings distribution and 0 otherwise. *Profit* is a binary variable equal to 1 if a firm is in the top 90 percent of the positive earnings distribution and 0 otherwise.

Table 4
Reserve Error Summary Statistics

Year	Mean	S.D.	25th Pctl	Median	75th Pctl
2003	0.0107	0.0768	0.0000	0.0027	0.0088
2004	0.0124	0.0696	0.0002	0.0028	0.0082
2005	0.0061	0.0621	-0.0002	0.0027	0.0081
2006	0.0085	0.0559	0.0000	0.0024	0.0062
2007	0.0041	0.0526	0.0000	0.0023	0.0061
2008	0.0110	0.0730	0.0000	0.0026	0.0069
2009	0.0031	0.0727	0.0000	0.0026	0.0060
2010	0.0075	0.0543	0.0000	0.0023	0.0058
2011	0.0021	0.0663	-0.0001	0.0021	0.0054
2012	-0.0009	0.0478	0.0000	0.0025	0.0054
2013	0.0044	0.0591	0.0000	0.0021	0.0057
2014	0.0000	0.0372	-0.0002	0.0021	0.0056
2015	0.0025	0.0377	0.0000	0.0022	0.0077

This table reports summary statistics by year for insurer loss reserve errors from 2003 to 2015. The reserve error is the difference between initial estimates of losses and the revised estimate one year later, scaled by the updated claims estimate. Positive values indicate over-reserving and negative values indicate under-reserving.

Table 5
Correlation Matrix

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1)	*Error*		**0.0585**	**-0.0308**	**0.1406**	**0.080**	**-0.0561**	**0.0571**	0.0052	**0.1102**	**0.0827**	-0.0255	-0.0181	0.0128
(2)	*MLR Regulation*	**0.0295**		**0.0702**	**0.0844**	**-0.062**	-0.0263	**-0.0910**	**-0.0648**	0.0164	**0.1014**	**-0.0480**	-0.0127	-0.0010
(3)	*Big 4*	-0.0208	**0.0702**		**0.1127**	-0.015	**-0.0756**	0.0131	0.0234	**-0.1283**	**0.0640**	0.0002	-0.0051	**-0.0299**
(4)	*Size*	**0.0629**	**0.0723**	**0.1000**		**0.096**	**-0.6490**	**0.1092**	**0.0976**	**0.0741**	**0.1017**	0.0009	-0.0240	**0.1301**
(5)	*Growth*	**0.0355**	0.0014	**-0.0305**	**-0.0636**		**-0.0344**	**0.1117**	0.0143	**-0.0711**	**-0.1244**	-0.0174	-0.0037	**-0.0769**
(6)	*Product Herf*	**-0.0401**	**-0.0392**	**-0.0620**	**-0.5856**	**0.0775**		**-0.1645**	**-0.0956**	-0.0258	0.0076	-0.0199	0.0120	**-0.0519**
(7)	*Reinsurance*	0.0134	**0.0730**	-0.0185	-0.0220	-0.0081	**0.0369**		-0.0010	0.0066	**-0.1419**	0.0140	0.0177	**-0.1330**
(8)	*Mutual*	**0.0389**	**-0.0648**	0.0234	**0.1160**	-0.0264	**-0.1149**	-0.0266		**-0.1057**	0.0158	0.0269	-0.0019	0.0151
(9)	*Public*	0.0160	0.0164	**-0.1283**	**0.0629**	-0.0261	-0.0092	-0.0179	**-0.1057**		**0.3018**	**-0.0393**	-0.0249	**0.0792**
(10)	*Group*	**0.0416**	**0.1014**	**0.0640**	**0.0924**	-0.0125	-0.0019	0.0133	0.0158	**0.3018**		-0.0043	-0.0211	**0.0368**
(11)	*Small Loss*	-0.0015	**-0.0480**	0.0002	0.0043	-0.0080	-0.0141	0.0059	0.0269	**-0.0393**	-0.0043		-0.0155	**-0.1579**
(12)	*Small Profit*	0.0005	-0.0127	-0.0051	-0.0192	-0.0053	0.0064	**0.0784**	-0.0019	-0.0249	-0.0211	-0.0155		**-0.2265**
(13)	*Profit*	**0.0325**	-0.0010	**-0.0299**	**0.1152**	**-0.1387**	**-0.0589**	**-0.0279**	0.0151	**0.0792**	**0.0368**	**-0.1579**	**-0.2265**	

This table reports correlations for the years 2003 to 2015. Pearson correlations are below the diagonal and Spearman correlations are shown above the diagonal. *Error* is the one-year loss reserve error scaled by revised estimated claims. *MLR Regulation* is a binary variable equal to 1 if a firm operated in a state with MLR regulation (pre-ACA) and 0 otherwise. *Big 4* is a binary variable equal to 1 if a firm has both a Big 4 audit firm and a Big 4 actuary. *Size* is the natural log of total assets. *Growth* is the one-year percent change in premiums written. *Product Herf* is a line-of-business Herfindahl index. *Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Mutual* is a binary variable equal to 1 if a firm is organized as a mutual and 0 otherwise. *Public* is a binary variable equal to 1 if a firm is publicly traded and 0 otherwise. *Small Loss* is a binary variable equal to 1 if a firm is in the top 5 percent of the negative earnings distribution and 0 otherwise. *Small Profit* is a binary variable equal to 1 if a firm has earnings in the bottom 5 percent of the positive earnings distribution and 0 otherwise. *Profit* is a binary variable equal to 1 if a firm is in the top 90 percent of the positive earnings distribution and 0 otherwise. Bolded values are significant at the 5 percent level.

Table 6
The Effect of MLR Regulation in the Pre-ACA Period

Dependent Variable: *Error*				
	(1)		(2)	
MLR Regulation			0.0015	***
			(0.0003)	
Size	0.0006	***	0.0006	***
	(0.0001)		(0.0001)	
Growth	0.0015	***	0.0015	***
	(0.0001)		(0.0001)	
Product Herf	-0.0008		-0.0005	
	(0.0011)		(0.0011)	
Reinsurance	0.0001		-0.0007	
	(0.0016)		(0.0016)	
Mutual	-0.0027		-0.0025	
	(0.0032)		(0.0032)	
Public	-0.0003		-0.0002	
	(0.0004)		(0.0004)	
Group	0.0018	***	0.0014	***
	(0.0004)		(0.0004)	
Small Loss	0.0013		0.0016	
	(0.0021)		(0.0020)	
Small Profit	-0.0018	*	-0.0017	*
	(0.0010)		(0.0010)	
Profit	-0.0004		-0.0003	
	(0.0004)		(0.0004)	
Intercept	-0.0079	***	-0.0092	***
	(0.0022)		(0.0023)	
Year FE	Yes		Yes	
X^2	219.99		305.50	
Obs	3,372		3,372	

This table reports coefficient estimates from GLS estimation. The dependent variable, *Error*, is a firm's loss reserve error scaled by revised estimated claims. *MLR Regulation* is a binary variable equal to 1 if a firm operated in a state with MLR regulation and 0 otherwise. *Size* is the natural log of total assets. *Growth* is the one-year percent change in premiums written. *Product Herf* is a line-of-business Herfindahl index. *Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Mutual* is a binary variable equal to 1 if a firm is organized as a mutual and 0 otherwise. *Public* is a binary variable equal to 1 if a firm is publicly traded and 0 otherwise. *Small Loss* is a binary variable equal to 1 if a firm is in the top 5 percent of the negative earnings distribution and 0 otherwise. *Small Profit* is a binary variable equal to 1 if a firm has earnings in the bottom 5 percent of the positive earnings distribution and 0 otherwise. *Profit* is a binary variable equal to 1 if a firm is in the top 90 percent of the positive earnings distribution and 0 otherwise. All models include year fixed effects. Standard errors account for autocorrelation and within-panel heteroskedasticity. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 7
The Effect of MLR Regulation in the Pre-ACA Period—External Monitoring

Dependent Variable: *Error*				
	(1)		(2)	
MLR Regulation	0.0017	***	0.0025	***
	(0.0004)		(0.0004)	
*MLR Regulation * Big 4*			-0.0068	***
			(0.0026)	
Big 4			0.0026	
			(0.0025)	
Size	0.0007	***	0.0008	***
	(0.0001)		(0.0001)	
Growth	0.0013	***	0.0013	***
	(0.0001)		(0.0001)	
Product Herf	0.0006		0.0009	
	(0.0012)		(0.0013)	
Reinsurance	-0.0009		-0.0016	
	(0.0018)		(0.0016)	
Mutual	-0.0013		-0.0012	
	(0.0037)		(0.0037)	
Public	0.0002		0.0001	
	(0.0005)		(0.0005)	
Group	0.0010	**	0.0012	**
	(0.0005)		(0.0005)	
Small Loss	0.0015		0.0013	
	(0.0021)		(0.0022)	
Small Profit	-0.0003		-0.0002	
	(0.0010)		(0.0010)	
Profit	0.0011	***	0.0008	*
	(0.0004)		(0.0004)	
Intercept	-0.0129	***	-0.0147	***
	(0.0025)		(0.0028)	
*MLR Regulation + MLR Regulation * Big 4 = 0*			(0.1004)	
Year FE	Yes		Yes	
X^2	218.53		273.86	
Obs	2,686		2,686	

This table reports coefficient estimates from GLS estimation. The dependent variable, *Error*, is a firm's loss reserve error scaled by revised estimated claims. *MLR Regulation* is a binary variable equal to 1 if a firm operated in a state with MLR regulation and 0 otherwise. *Big 4* is a binary variable equal to 1 if a firm had both a Big 4 auditor and a Big 4 actuary. *Size* is the natural log of total assets. *Growth* is the one-year percent change in premiums written. *Product Herf* is a line-of-business Herfindahl index. *Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Mutual* is a binary variable equal to 1 if a firm is organized as a mutual and 0 otherwise. *Public* is a binary variable equal to 1 if a firm is publicly traded and 0 otherwise. *Small Loss* is a binary variable equal to 1 if a firm is in the top 5 percent of the negative earnings distribution and 0 otherwise. *Small Profit* is a binary variable equal to 1 if a firm has earnings in the bottom 5 percent of the positive earnings distribution and 0 otherwise. *Profit* is a binary variable equal to 1 if a firm is in the top 90 percent of the positive earnings distribution and 0 otherwise. All models include year fixed effects. Standard errors account for autocorrelation and within-panel heteroskedasticity. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 8
The Effect of MLR Regulation – Difference in Differences

Dependent Variable: *Error*				
	(1)		(2)	
No MLR	-0.0019	***	-0.0016	***
	(0.0003)		(0.0004)	
*No MLR * ACA*	0.0015	***	0.0013	**
	(0.0005)		(0.0006)	
Size			0.0006	***
			(0.0001)	
Growth			0.0015	***
			(0.0001)	
Product Herf			0.0005	
			(0.0008)	
Reinsurance			0.0011	
			(0.0018)	
Mutual			-0.0011	
			(0.0018)	
Public			0.0018	***
			(0.0003)	
Group			0.0010	***
			(0.0004)	
Small Loss			-0.0002	
			(0.0013)	
Small Profit			-0.0012	*
			(0.0007)	
Profit			-0.0007	***
			(0.0003)	
Intercept	0.0024	***	-0.0091	***
	(0.0003)		(0.0019)	
Year FE	Yes		Yes	
X^2	107.11		386.58	
Obs	6,098		5,833	

This table reports coefficient estimates from GLS estimation. The dependent variable, *Error*, is a firm's loss reserve error scaled by revised estimated claims. *No MLR* is a binary variable equal to 1 if a firm operated in a state with no MLR regulation prior to the passage of the ACA and 0 otherwise. *ACA* is a binary variable equal to 1 in the ACA period and 0 otherwise. *Size* is the natural log of total assets. *Growth* is the one-year percent change in premiums written. *Product Herf* is a line-of-business Herfindahl index. *Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Mutual* is a binary variable equal to 1 if a firm is organized as a mutual and 0 otherwise. *Public* is a binary variable equal to 1 if a firm is publicly traded and 0 otherwise. *Small Loss* is a binary variable equal to 1 if a firm is in the top 5 percent of the negative earnings distribution and 0 otherwise. *Small Profit* is a binary variable equal to 1 if a firm has earnings in the bottom 5 percent of the positive earnings distribution and 0 otherwise. *Profit* is a binary variable equal to 1 if a firm is in the top 90 percent of the positive earnings distribution and 0 otherwise. All models include year fixed effects. Standard errors account for autocorrelation and within-panel heteroskedasticity. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 9
Distribution of Overstated vs. Understated Claims in post-ACA MLR Filings

Panel A: All Lines, Pooled

	N	% Understating Claims	% Overstating Claims	% Same Claims	Overstate/ Understate Ratio
At or Above Threshold	6,230	40.0%	48.8%	11.2%	1.22
Below Threshold	1,681	31.2%	63.7%	5.2%	2.04
All Observations	7,911	38.1%	52.0%	9.9%	1.36

Panel B: Individual Market

	N	% Understating Claims	% Overstating Claims	% Same Claims	Overstate/ Understate Ratio
At or Above Threshold	1,892	35.8%	51.1%	13.1%	1.43
Below Threshold	764	27.7%	66.1%	6.2%	2.38
All Individual Market Observations	2,656	33.5%	55.4%	11.1%	1.65

Table 9
Distribution of Overstated vs. Understated Claims in post-ACA MLR Filings (continued)

Panel C: Small Group Market

	N	% Understating Claims	% Overstating Claims	% Same Claims	Overstate/ Understate Ratio
At or Above Threshold	2,056	40.1%	49.2%	10.7%	1.23
Below Threshold	475	35.4%	62.1%	2.5%	1.76
All Small Group Market Observations	2,531	39.2%	51.6%	9.2%	1.32

Panel D: Large Group Market

	N	% Understating Claims	% Overstating Claims	% Same Claims	Overstate/ Understate Ratio
At or Above Threshold	2,282	43.4%	46.5%	10.1%	1.07
Below Threshold	442	32.6%	61.1%	6.3%	1.88
All Large Group Market Observations	2,724	41.6%	48.9%	9.5%	1.17

This table reports summary statistics relating to MLR reporting from 2011 to 2015. Panel A provides aggregate results, while panels B, C, and D provide results for the individual, small group, and large group markets, respectively. Firms at or above the threshold had reported MLRs that met or exceed the MLR standard for their state and line. Firms below the threshold had MLRs less than the stated MLR standard and, therefore, had to pay rebates. Firms understated (overstated) claims if they had a negative (positive) reserving error.

Table 10
Determinants of Claims Errors in Post-ACA MLR Reporting
Panel A: Pooled Effect of MLR Threshold

	(1)		(2)		(3)	
Below MLR	0.0072	***	0.0069	***	0.0072	***
	(0.0011)		(0.0011)		(0.0011)	
*Below MLR*Big 4*			0.0056		0.0041	
			(0.0111)		(0.0137)	
Big 4			-0.0025	**	-0.0014	
			(0.0012)		(0.0010)	
Size					0.0011	***
					(0.0003)	
Growth					0.0006	
					(0.0012)	
Product Herf					0.0005	
					(0.0019)	
Reinsurance					0.0054	
					(0.0035)	
Mutual					-0.0001	
					(0.0016)	
Public					-0.0010	
					(0.0007)	
Group					-0.0040	*
					(0.0021)	
Small Loss					0.0012	
					(0.0021)	
Small Profit					-0.0044	
					(0.0030)	
Profit					-0.0013	
					(0.0010)	
Intercept	0.0028	***	0.0030	***	-0.0152	***
	(0.0010)		(0.0010)		(0.0055)	
Year FE	Yes		Yes		Yes	
Line FE	Yes		Yes		Yes	
R^2	1.68%		1.73%		2.65%	
F-Stat	8.27		7.33		4.34	
Obs	7,686		7,686		6,604	

Table 10
Determinants of Claims Errors in Post-ACA MLR Reporting
Panel B: Effect of MLR Threshold Varying by Line

	(1)		(3)	
*Below MLR*Individual*	0.0129	***	0.0134	***
	(0.0023)		(0.0024)	
*Below MLR*Small Group*	0.0019	*	0.0019	*
	(0.0011)		(0.0012)	
*Below MLR*Large Group*	0.0042	***	0.0036	***
	(0.0010)		(0.0012)	
Size			0.0012	***
			(0.0003)	
Growth			0.0004	
			(0.0012)	
Product Herf			0.0008	
			(0.0019)	
Reinsurance			0.0044	
			(0.0037)	
Mutual			0.0002	
			(0.0017)	
Public			-0.0008	
			(0.0007)	
Group			-0.0041	*
			(0.0022)	
Small Loss			0.0012	
			(0.0023)	
Small Profit			-0.0042	
			(0.0030)	
Profit			-0.0016	*
			(0.0010)	
Intercept	0.0010		-0.0191	***
	(0.0010)		(0.0059)	
Year FE	Yes		Yes	
Line FE	Yes		Yes	
R^2	2.22%		3.23%	
F-Stat	7.28		3.91	
Obs	7,698		7,584	

This table reports coefficient estimates from OLS estimation. The dependent variable, *Error*, is a firm-state-line's loss reserve error scaled by revised estimated claims. *Below MLR* is a binary variable equal to 1 if a firm's unmanipulated MLR was below the MLR standard and 0 otherwise. *Big 4* is a binary variable equal to 1 if a firm had both a Big 4 auditor and a Big 4 actuary. *Size* is the natural log of total assets. *Growth* is the one-year percent change in premiums written. *Product Herf* is a line-of-business Herfindahl index. *Reinsurance* is reinsurance ceded divided by direct premiums plus reinsurance assumed. *Mutual* is a binary variable equal to 1 if a firm is organized as a mutual and 0 otherwise. *Public* is a binary variable equal to 1 if a firm is publicly traded and 0 otherwise. *Small Loss* is a binary variable equal to 1 if a firm is in the top 5 percent of the negative earnings distribution and 0 otherwise. *Small Profit* is a binary variable equal to 1 if a firm has earnings in the bottom 5 percent of the positive earnings distribution and 0 otherwise. *Profit* is a binary variable equal to 1 if a firm is in the top 90 percent of the positive earnings distribution and 0 otherwise. *Individual*, *Small Group*, and *Large Group* are binary variables representing the three lines of business for MLR reporting. All models include year and line fixed effects. Standard errors are clustered at the firm level. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

Table 11
Effect on Policyholder Rebates

Panel A: All Lines, Pooled

Year	Aggregate Reported Rebate	Aggregate True Rebate	$ Difference	% Difference
2011	777,801,662	875,440,687	97,639,025	12.6%
2012	357,424,840	397,784,208	40,359,369	11.3%
2013	285,873,840	303,417,514	17,543,674	6.1%
2014	454,543,310	500,398,623	45,855,313	10.1%
2015	329,700,294	347,516,931	17,816,637	5.4%
Total	2,205,343,946	2,424,557,963	219,214,017	9.9%

Panel B: Individual Market

Year	Aggregate Reported Rebate	Aggregate True Rebate	$ Difference	% Difference
2011	262,988,841	315,927,604	52,938,763	20.1%
2012	147,110,076	152,819,037	5,708,961	3.9%
2013	112,479,284	119,566,360	7,087,075	6.3%
2014	226,289,540	260,125,164	33,835,625	15.0%
2015	92,882,914	103,808,241	10,925,327	11.8%
Total	841,750,655	952,246,406	110,495,752	13.1%

Table 11
Effect on Policyholder Rebates (continued)

Panel C: Small Group Market

Year	Aggregate Reported Rebate	Aggregate True Rebate	$ Difference	% Difference
2011	185,153,299	229,506,550	44,353,251	24.0%
2012	116,609,319	121,329,263	4,719,945	4.0%
2013	102,054,896	116,072,885	14,017,988	13.7%
2014	139,929,684	144,375,473	4,445,789	3.2%
2015	149,902,944	152,756,986	2,854,042	1.9%
Total	693,650,142	764,041,157	70,391,015	10.1%

Panel D: Large Group Market

Year	Aggregate Reported Rebate	Aggregate True Rebate	$ Difference	% Difference
2011	329,659,523	330,006,533	347,010	0.1%
2012	93,705,445	123,635,908	29,930,463	31.9%
2013	71,339,659	67,778,269	-3,561,390	-5.0%
2014	88,324,086	95,897,985	7,573,899	8.6%
2015	86,914,436	90,951,705	4,037,268	4.6%
Total	669,943,149	708,270,400	38,327,251	5.7%

This table reports MLR rebates for 2011 to 2015. Panel A provides aggregate results, while panels B, C, and D provide results for the individual, small group, and large group markets, respectively. Aggregate Reported Rebates are rebates actually paid by insurers during the sample year. Aggregate True Rebates are the rebate insurers would have paid if claim estimate error was zero for all firms. The difference represents the dollar difference between actually paid rebates and the rebates with no estimation error. The percent difference is the dollar difference divided by actually paid rebates.