REGULATING PROFITABILITY*

Laura Lingyu Gu[a], Siqi Xue[b]

[a]*Booth School of Business, The University of Chicago*
[b]*Kellogg School of Management, Northwestern University*

March 2026

Abstract

This paper examines how firms strategically raise costs through transactions with vertically integrated entities to meet regulatory profitability thresholds, and the consequences for consumers. Using the Affordable Care Act's minimum medical loss ratio (MLR) rule as an exogenous shock on insurers' allowable profit margins, we show that noncompliant insurers significantly increase average claim costs and affiliated transactions following the regulation. Further, we show that among insurers with pre-existing vertical integration, a one-standard-deviation increase in distance from the profitability threshold is associated with an annual cost increase of 5.7% ($159.6 per consumer), which is 6.2 times the increase for insurers with no pre-existing vertical integration. We also find that the effect is more pronounced in the individual market, where a one-standard-deviation increase in MLR distance from regulatory threshold is associated with a 7.3% increase for noncompliant units compared to compliant ones, translating to $167.2 per individual consumer per year. Moreover, we document negative consumer impacts associated with this regulatory circumvention: medical treatment quantity declines by 2.4%. Lastly, we find that noncompliant insurers are more likely to vertically integrate after regulation, and these deals are associated with lower expected synergies. Together, our findings suggest the need for closer regulatory scrutiny of affiliated transactions facilitated by vertical integration and their implications for patient welfare. It also sheds light on a factor behind increasing healthcare expenditure in the US.

JEL Classifications: L22, M48, G22, H87
Keywords: Vertical integration, Affiliated transactions, Healthcare costs, Health outcomes

*We thank Phil Berger, David Matsa, Dimitris Papanikolaou, Molly Schnell, Amanda Starc, and Chris Stewart for their invaluable comments and support. We also thank Samuel Chang, Nicolas Crouzet, Marco Errico, Gene Fama, Sean Higgins, Charlie McClure, Jacopo Ponticelli, Lulu Wang, Thomas Wollmann, and seminar participants at Northwestern Kellogg Brown Bag, Chicago Booth Lab Class, Chicago Booth Informal Workshop, UChicago PhD Student Applied Microeconomics Lunch for their helpful discussions and comments. We acknowledge financial support from Chicago Booth Stevens Doctoral Program and Northwestern Kellogg Doctoral Program. All errors are our own.
Email addresses: lgu@chicagobooth.edu (Laura Lingyu Gu), siqi.xue@kellogg.northwestern.edu (Siqi Xue)

1. Introduction

Profitability regulation is a common tool used by regulators to oversee industries where competition is limited and firms possess substantial market power. This constrains allowable profits to prevent excessive pricing and protect consumers, as seen in the U.S. utilities, health insurance and other financial sectors. When these rules rely on accounting measures of costs and revenues, however, firms may have incentive to adjust their organizational structure or internal transactions in ways that satisfy regulatory thresholds without changing underlying business performance. At the same time, a long line of research finds that firms benefit from vertical integration through enhanced product-market advantages and improved contracting efficiencies (e.g., Acemoglu et al., 2009; Brickley et al., 2012; Shenoy, 2012; Frésard et al., 2020). Similarly, regulators have generally taken a permissive stance toward vertical integration, emphasizing its potential to generate efficiency gains and improve coordination of services. However, little is known about firms' incentives to use vertical integration to circumvent profitability regulations, which may harm consumers and trigger enforcement actions by regulators, ultimately destroying value.[1]

In this paper, we empirically examine whether firms strategically use vertical integration to circumvent profitability regulation. Specifically, we study whether US health insurers inflate costs through increased transactions with vertically integrated affiliates to satisfy regulatory profitability thresholds. We leverage the setting of medical loss ratio (MLR) regulation in US healthcare insurance market, which went into effect in 2011 as part of the Affordable Care Act (ACA). It requires at least 80% (85%) of insurers' premium revenues to be spent on healthcare expenses in the individual and small-group employer (large-group employer) markets. Combining vertical integration transactions with the insurer financial data, our

[1] In 2023, US acquirers engaged in vertical integration deals with an aggregate value of approximately $566.3 billion. Given their economic importance, the social benefits and costs of these integrations have been a central concern of regulators. For example, the Federal Trade Commission (FTC) issued the 2023 Merger Guidelines to provide a framework for increasing transparency regarding the agency's enforcement approach. The guidelines include dedicated sections for vertical mergers, in which consumer outcomes play a key role in the evaluation.

empirical analysis shows that insurers facing the regulatory constraint significantly increase reported claim costs and affiliated transactions following the policy. These responses are substantially stronger among insurers with pre-existing vertical integration structures, suggesting that vertical integration facilitates the strategic adjustment of internal transactions to satisfy the MLR rule. We further show that these responses have real consequences for consumers through higher cost sharing and reduced utilization of medical services. Results highlights that vertical integration structure can be used as a way to circumvent profitability regulation, which deliver unintended consequences to consumers. This mechanism also shed light on the factors behind the rapid growth of US healthcare spending, which has outpaced economic growth and is projected to exceed 20% of GDP by 2033 (CMS, 2023).

We begin with a simple theoretical framework modeling insurer behavior in a vertically integrated structure. Insurers whose MLRs fell short of the regulatory threshold before 2011 have the options to directly issue rebates, decrease premiums, or increase medical costs. The model delivers two important predictions. First, the model predicts that value-maximizing insurers will choose to inflate their expenditures via transactions with affiliated entities. Specifically, the parent insurance company can reimburse its affiliated provider subsidiaries at higher rates for medical services or cover more medical services. This action directly inflates the numerator of the MLR calculation (i.e., the expense), allowing the insurer to meet the regulatory threshold and avoid costly rebates. This benefits the consolidated firm, as the subsidiary records higher revenue while the consolidated firm preserves its overall profits.[2] Second, our model predicts direct externalities on consumers with a larger increase in coinsurance paid by patients and lower medical treatment adherence. A patient's coinsurance is calculated as the percentage of the total medical cost for a service paid by the patient once the deductible has been met. Thus, when the underlying reimbursement costs paid by

[2]Vertical integration between insurers and providers has increasingly attracted regulators' scrutiny in recent years. In 2024, for example, the Federal Trade Commission (FTC) investigated and issued a report on the prices charged by pharmacies affiliated with Cigna. Cigna argued that the drugs highlighted in the FTC report represented only a fraction of its full formulary and that the FTC unfairly chose those drugs for analysis.

the insurer increases, the dollar amount of the patient's coinsurance payment mechanically rises through the standard cost-sharing insurance plan arrangements. This increase in the out-of-pocket cost of care can change patient behavior. For recurring medical needs, higher coinsurance payments can deter consumption, leading patients to delay necessary treatments due to budget constraints.

To test model predictions, we use insurer financial data from the National Association of Insurance Commissioners (NAIC), which provide insurer-state-market-level information on enrollment, claims expenses, and premiums written. Our sample period spans 2005–2013, excluding 2008 and 2009.[3] [4] Our data includes all for-profit health insurers. Data on vertical integration deals are obtained from SDC Platinum in the Refinitiv LSEG database. We first match insurers in the NAIC data with acquirers in the SDC data. We then review the matched mergers and acquisitions to identify vertical integration deals.[5] We collapse the deal data to the insurer-year level, aggregate the number of deals, and merge these with the insurer financial data, measured at the insurer-market-state level.

We begin by validating insurers' revealed preferences in response to the MLR regulation. Specifically, we examine whether the costs and affiliated transactions of noncompliant insurers increase following the regulation. We employ a difference-in-differences research design with changes in costs and affiliated transactions as the dependent variables. We construct a treatment variable capturing the pre-period MLR distance from the regulatory threshold (Cicala et al., 2019), defined as the difference between the regulatory threshold and the insurer's average MLR in the pre-regulation period when the insurer's MLR falls below the threshold, and zero otherwise. We find that, a one-standard-deviation increase of MLR

[3] Our sample stops in 2013 following Cicala et al. (2019). Beginning in 2014, the ACA's health insurance exchanges, individual mandate, and essential health benefits reduced individual and small-group risk rating and reshaped these markets.

[4] We exclude 2008–2009 to more precisely estimate the magnitude associated with the MLR rule, because recession-related changes in coverage and utilization may induce non-representative cost changes in commercial insurance markets. All results are robust to including these two years in the sample.

[5] We also review the equal merger deals in SDC over our sample period to identify cases in which insurers may be classified as targets.

distance from threshold is associated with 4.4% of cost increase. Further, using affiliated-transactions data available at the insurer–year level, we estimate a pooled effect and find that a one-standard-deviation increase in the weighted insurer-level MLR distance from the threshold is associated with a 3.9% increase in transactions with affiliated entities. These findings support our model's prediction that increasing costs through affiliated transactions is the preferred regulatory response for noncompliant insurers.

We next corroborate the mechanism of cost inflation through vertically integrated entities. We also gauge the effect on costs through this mechanism at the level at which the regulation is binding (i.e., insurer-market-state-year). We test whether, after the regulation, noncompliant insurer-market-state units with a pre-existing vertical integration structure increase costs more than those without such a structure. Among units with pre-existing vertical integration, a one-standard-deviation increase in distance from the profitability threshold is associated with an additional annual cost increase of 5.7%, which translates to $159.6 per enrollee per year. In contrast, the effect for noncompliant units without pre-existing vertical integration is statistically insignificant and 6.2 times smaller in magnitude. In addition, our dynamic event-study analysis helps assess the validity of the parallel trends assumption, showing no increasing trend in the pre-period for either group.

The cost increase rises in the individual market. Among insurer-market-state units with pre-existing vertical integration, a one-standard-deviation increase in MLR distance from regulatory threshold is associated with a 7.3% increase for noncompliant units compared to compliant ones, translating to $167.2 per enrollee per year. In the group market, the corresponding estimate is a 4.9% increase, or $142.1 per enrollee per year. Consistent with our prediction, the effect for noncompliant units without pre-existing vertical integration is statistically insignificant in both individual and group markets, and the implied magnitude is 6–8 times smaller.

Further, we examine the economic consequences of these cost increases for patients' outcomes. We find that, for insurers with pre-period vertical integration deals with hospitals,

a one-standard-deviation increase in state-level MLR distance is associated with a 2.4% decrease in medical treatment quantity of patients. We also conducted a placebo test by matching insurer with no pre-period vertical integration deals with hospital with the state average medical treatment quantity change. We found no significant change in medical treatment quantity of patients, and the magnitude is also small. This suggests a strong association between higher healthcare costs and reduced treatment utilization by patients.

Moreover, we examine whether vertical integration is a response to the profitability regulation among noncompliant insurers. We find that an average noncompliant insurer with no pre-period vertical integration is 23.8% more likely to vertically integrate after regulation in our sample period. Our event-study evidence suggests that this increase is concentrated in the final year of our sample (2013). For noncompliant insurers with pre-existing vertical integration, we also document a moderate increase in deal likelihood, consistent with their expansion of affiliated-transaction channels following the regulation. Finally, we find that expected deal synergies, proxied by three-day cumulative abnormal returns around the deal announcement date, are significantly lower for post-regulation deals than for deals announced before the regulation. Lastly, we conduct several tests to mitigate concerns about the sensitivity of our findings using alternative regression specifications.

Our paper makes three key contributions. First, it contributes to the literature examining the determinants of vertical integration (Hortaçsu and Syverson, 2007; Acemoglu et al., 2009; Fathollahi et al., 2021; Lee et al., 2021; Brot, Che and Handel, 2025). Research shows that firms vertically integrate to gain product-market advantages and improve contracting efficiency along the supply chain (Lafontaine and Slade, 2007; Shenoy, 2012; Luco and Marshall, 2020). We contribute to this literature by showing that regulatory incentive is also an important determinant of vertical integration decisions. We highlight the role of vertical integration in enabling firms to manage costs across affiliated entities, consistent with the findings of Berger and Hann (2007) that managers opportunistically report to distort segment performance.

Second, this study contributes to the literature on healthcare spending and health outcomes (Papanicolas et al., 2018; Eliason et al., 2018; Gupta et al., 2024; Dieleman et al., 2025). An emerging body of work shows that consolidation in the healthcare industry affects healthcare spending and health outcomes (Eliason et al., 2020; Feng et al., 2024; Wollmann, 2024; Cooper et al., 2025; Starc and Wollmann, 2025; Yde, 2025). We show that insurers' vertical integration significantly increases healthcare spending, which in turn reduces patients' treatment adherence. While Cicala et al. (2019) find that insurers increased their claim costs to comply with the MLR regulation, we further show that vertical integration is a key mechanism through which the claim costs have increased.

The closest related paper is Yde (2025), who structurally estimates a model using data from four insurer-Pharmaceutical Benefit Manager (PBM)-pharmacy conglomerates and finds that these firms raise drug prices to shift profits in Medicare Part D. While our proposed mechanism overlaps with Yde (2025), we study the commercial insurance market, where contract design and pricing differ, potentially leading to different empirical inferences and policy implications (Brown and Finkelstein, 2008).[6] Furthermore, We provide additional evidence that vertical integration is a response to profitability regulation, whereas Yde (2025) focuses on cost inflation through existing vertical integration.

Third, our study extends the literature on threshold-based regulation by documenting firms' strategic behavior in response to regulatory incentives as well as the unintended economic consequences of that behavior (Leuz and Wysocki, 2016; Weber and Yang, 2020; Eastman, Eckles, and Van Buskirk, 2021; Ballew, Iselin and Nicoletti, 2022; Kepler, Naiker, and Stewart, 2023). In addition, this study contributes to the literature on transfer pricing. Previous studies show that firms strategically adjust internal prices to shift profits across divisions or entities toward lightly regulated or lower-tax units (Baldenius et al., 2004; Bernard et al., 2006 and Guo, 2017). Our study adds to this literature by highlighting how firm

[6]Moreover, we compare compliant and noncompliant insurers based on their pre-regulation vertical integration structure in the commercial insurance market, which provides large-sample evidence on average effects of cost increase as well as outpatient treatment outcomes.

boundaries can be used for regulatory arbitrage via internal pricing.

This paper proceeds as follows. Section 2 provides the background of the MLR setting and a simple theoretical framework of insurer behavior facing profitability regulation under a vertically integrated structure. Section 3 introduces the primary data sources and identification strategy. Section 4 presents the empirical results. Section 5 concludes the discussion.

2. Background and Hypothesis

2.1. Background

To incentivize insurers to direct more of their expenditures to benefit customers and to help lower aggregate insurance costs, Congress passed the Patient Protection and Affordable Care Act (ACA) in 2010.[7] ACA imposed a minimum spending requirement (i.e., medical loss ratio, or MLR) on certain health insurers starting from 2011. The MLR established minimum requirements on health insurers' spending on medical claims and quality improvement as a proportion of premium revenues.[8] This applies to all health insurance sold in fully insured commercial markets, thereby capping insurers' profit margins but not their levels. Any insurer that underwrites health insurance contracts with at least 1,000 life-years (i.e., one person insured for one year) must maintain an MLR of at least 80% in the individual and small group market segments and 85% in the large group market segment starting from 2011. MLR is calculated as the average value on a rolling three-year basis. Health insurers that do not comply must issue rebates to customers based on their realized MLR each year. In

[7]The debate over the ACA evolved significantly between mid-2009 and its enactment in March 2010, and public opinion remained sharply divided. Early discussions centered on broad structural reforms, including a proposed public insurance option and insurance exchanges. Following enactment, skepticism about the reform persisted, and insurers publicly committed to compliance while continuing to advocate for greater flexibility in implementation. See Appendix OA.A for more details.

[8]In our empirical analyses, we focus on changes in medical claims costs because quality-improvement spending accounts for only 0.6% of these expenditures in our sample. In untabulated analyses, we find that quality-improvement spending increases significantly for noncompliant insurers.

2011, rebates totaling $1 billion were issued to policyholders.[9] [10]

Prior to the ACA, 29 states had some form of MLR regulation, but these provisions generally appear to have been weakly enforced. In several states, the formal thresholds were quite low: among states with any MLR rule in place, the median minimum requirement was only 0.65. Even in states that nominally imposed higher standards, effective enforcement was limited. For instance, in states where the individual-market MLR threshold was at least 0.75, more than 40 percent of life-years in 2010 were enrolled in plans that did not satisfy the requirement.

The ACA moved minimum MLR regulation to the federal level and changed enforcement. The thresholds are not applied at the level of individual plans or even individual insurers. Instead, each insurer pools all of its business within a given state, market segment, and year, and the realized MLR for this aggregated block of business must satisfy the applicable minimum. The required MLR is 0.80 in the individual and small-group markets and 0.85 in the large-group market. In the year immediately before these federal standards took effect, more than 52 percent of consumers in the individual market were enrolled in plans with an MLR below 0.80. Starting in 2011, insurers whose realized MLR falls short of the relevant threshold are required to issue rebates to their policyholders.

On the other hand, regulators have adopted a relatively permissive stance toward vertical integration. In 2018, the Department of Justice (DOJ) approved the Cigna–Express Scripts and CVS–Aetna deals—valued at $67 billion and $69 billion respectively—requiring

[9]The average rebate for below-threshold insurance companies accounts for about 7% of their total annual profits.

[10]The ACA introduced several major regulations. In 2014, public health insurance exchanges, the individual mandate, and standardized essential health benefits greatly reduced individual risk rating and reshaped the individual and small-group markets. This is why our sample in the main analysis stops in 2013. However, extending the sample period to years beyond 2013 still yields robust and consistent results. The 2011 Effective Rate Review, which triggers scrutiny if proposed premium growth exceeds 15%, also limits insurers' ability to raise premiums and may curtail any bargaining power gains from integration. Thus, our results likely represent a lower-bound estimate of vertical integration's effects on costs and premiums. Other concurrent ACA changes—such as extended dependent coverage, reduced cost-sharing for preventive care, removal of lifetime limits, and creation of a national high-risk pool—will be discussed in our results section.

only the divestiture of one Aetna subsidiary in the latter case. While the DOJ emphasized that horizontal consolidation could increase market concentration and potentially harm consumers, it expressed greater confidence in vertical integration. In particular, the agency highlighted the prospect of efficiency gains and improved coordination of care, which could generate benefits for patients.[11]

2.2. Theoretical Framework and Hypothesis

To study insurers' strategic response, we consider a simple market with a representative consumer (C), an insurer (I), and a healthcare provider (P). The insurer and provider are vertically integrated and behave as a single consolidated firm that chooses prices subject to a binding MLR regulation. Detailed derivations and proofs are provided in Appendix B.

Let p denote the insurance premium, with enrollee demand $n(p)$. Let c be the internal reimbursement rate from I to P and k the marginal cost of delivering one unit of healthcare, with $k < c$. The consumer faces a coinsurance rate $\theta \in (0, 1)$, so the out-of-pocket price of care is $p_c = \theta c$, and consumes $q(p_c)$ units of medical care. We denote by $\underline{M} \in (0, 1)$ the regulatory minimum MLR.

Under vertical integration, the consolidated profit is $\pi_{Total} = \pi_I + \pi_P = n(p)[p - q(\theta c)(k - \theta c)]$. The internal transfer price c enters consolidated profit only through its effect on the consumer's out-of-pocket price $p_c = \theta c$ and thus on $q(p_c)$.

We impose two assumptions on the demand elasticities for insurance and medical care. First, consumer demand for insurance is relatively inelastic ($\epsilon_{ins} = \left|\frac{\partial n}{\partial p}\frac{p}{n}\right| < 1$). Second, demand for medical care is inelastic but downward-sloping in the out-of-pocket price ($\epsilon_{med} = \left|\frac{\partial q}{\partial p_c}\frac{p_c}{q}\right| < 1 \quad \text{and} \quad \frac{\partial q}{\partial p_c} < 0$).

The MLR regulation imposes a floor on the ratio of claims to premiums. An insurer is compliant if its MLR satisfies $MLR = \frac{(1-\theta)c \cdot q(\theta c)}{p} \geq \underline{M}$.

[11] See Appendix OA.B.1 for additional details. Market expansion, service diversification, and coordinated care delivery are also often stated as the strategic motivations underlying these vertical integration. In addition, a greater focus on cost integration is considered in recent years. See Appendix OA.D for illustrative examples of transactions and their stated rationales.

We focus on a noncompliant firm with $MLR_0 < \underline{M}$ that must adjust to satisfy the regulation. Let R_{req} denote the required per-enrollee increase in claims or equivalent rebate to just meet the threshold, which can be approximated by $R_{req} \approx p \cdot \underline{M} - (1-\theta)c \cdot q$.

The noncompliant integrated firm evaluates three strategies to restore MLR compliance and maximize consolidated profit.

The firm's first option is to keep (p, c, q) fixed and issue a rebate R_{req} to consumers. Consolidated profit becomes $\pi_{(i)} = n(p)[p - q(\theta c)(k - \theta c)] - n(p) \cdot R_{req}$. The rebate is a pure cash payment to consumers.

The firm's second option is to reduce the premium from p to p_{new} until the MLR constraint binds: $p_{new} = \frac{(1-\theta)c \cdot q(\theta c)}{\underline{M}}$. The resulting consolidated profit is $\pi_{(ii)} = n(p_{new})[p_{new} - q(\theta c)(k - \theta c)]$.

The firm's third option is to increase the internal reimbursement rate from c to c' so that $\frac{(1-\theta)c' \cdot q(\theta c')}{p} = \underline{M}$. Because this is an internal transfer, the higher "cost" accrues to the provider division. Consolidated profit is $\pi_{(iii)} = n(p)[p - q(\theta c')(k - \theta c')]$. Relative to the initial position, this strategy preserves the premium p but raises patients' out-of-pocket price from $p_c = \theta c$ to $p'_c = \theta c'$ and thus lowers q.

We compare the profitability of the three strategies under Assumptions 1 and 2.

Proposition 1. *For a vertically integrated firm, inflating internal costs is more profitable than issuing rebates:* $\pi_{(iii)} > \pi_{(i)}$.

Proposition 2. *For a vertically integrated firm, inflating internal costs dominates premium cuts:* $\pi_{(iii)} > \pi_{(ii)}$.

Propositions 1 and 2 imply that, for a noncompliant vertically integrated firm, raising the internal transfer price c to c' is the profit-maximizing way to satisfy the MLR constraint.

These theoretical results lead to two empirical predictions that guide our analysis.

Hypothesis 1. *After the ACA regulation, insurers with an MLR below the regulatory threshold are more likely to raise costs through transactions with vertically integrated entities, com-*

pared to those with an MLR above the threshold.

Under strategy (iii), the internal transfer price rises from c to $c' > c$, so patients' out-of-pocket price increases from $p_c = \theta c$ to $p'_c = \theta c'$. By Assumption 2, $\frac{\partial q}{\partial p_c} < 0$, so higher p_c mechanically reduces q, i.e., medical adherence, which leads to our second hypothesis.

Hypothesis 2. *After the ACA regulation, patients covered by noncompliant insurers (that choose strategy (iii)) experience higher coinsurance payments, which in turn decreases their medical adherence.*

3. Data

3.1. Data Sources, Sample Selection, and Key Variables

Our main data source is the insurance statutory filings from the National Association of Insurance Commissioners (NAIC). These data provide comprehensive insurer-level underwriting details. For this study, we use data from the health insurance exhibit of utilization, premiums, and enrollment, which provide information on enrollment, claim expenses, and premiums written. Our sample period spans 2005–2013 and exclude 2008-2009. Our sample includes all insurers in the health insurance sector.[12]

Data on vertical integration deals are obtained from SDC Platinum in the Refinitiv LSEG database. We first match insurers in the NAIC data with acquirers in the SDC data.[13] We then review the matched M&A to identify vertical integration deals, defined as those with targets in the healthcare sector that do not operate solely in insurance. We collapse the data to the insurer–year level, aggregating both the number and total value of deals, and merge these with the insurers' financial data described above.[14]

[12] A notable omission from the NAIC datasets is the majority of insurers in California, which have different reporting requirements and report directly to the state rather than to the NAIC.

[13] We also review the mergers of equals in SDC during our sample period to check for deals in which insurers may be classified as targets, and we do not find any such mergers of equals.

[14] An "insurer" as defined here is a unique reporting entity within a state, not a unique insurer "group" within a state. For example, LifeWise Health Plan of Washington is owned and operated by Premera Blue Cross but reports to the NAIC under a separate licensing number; thus, LifeWise and Premera are considered

To construct the final analysis dataset, we drop outlier observations with MLRs below the 1st percentile or above the 99th percentile, exclude observations with missing or negative values in key variables (claims, premiums, and enrollment), and remove insurer observations with fewer than 1,000 covered lives.[15] Most outliers fall into the latter category, so these restrictions are highly overlapping. We also exclude observations from California (with reasons stated in 12). Finally, because our identification strategy relies on pre-period MLRs to determine whether an insurer is likely to be directly affected by the regulation, we restrict the sample to insurers with at least one year of pre-period data (2010 or earlier).

From the NAIC data, we construct a dataset at the insurer (i)–market segment (m)–state (s)–year (t) level. To capture the extent to which an insurer falls below the regulatory threshold, we compute a distance variable for each insurer i -market m - state s unit in the pre-period as follows:

$$MLR\ Dist_{ims} = \begin{cases} Threshold_m - Avg.MLR_{ims} & \text{if } Avg.MLR_{ims} < Threshold_m \\ 0 & \text{if } Avg.MLR_{ims} \geq Threshold_m \end{cases}$$

where $Avg.MLR_{ims}$ is the average MLR over the five years before the regulation with MLR calculated as $\frac{Claims_{imst}}{Premiums_{imst}}$ in each year t. For the time-invariant $MLR\ Dist_{ims}$ used in the difference-in-differences analysis, we calculate the difference between the threshold and $Avg.MLR_{ims}$ if the unit is below the threshold, and zero otherwise. The threshold is the regulated medical loss ratio for each market segment m under the ACA regulation. These empirical strategies are described in detail in Section 3.2.

different insurers for the purposes of this analysis. Additionally, insurers commonly report their HMO business separately from the rest of their business, and thus these are treated separately. For vertical integration deals, we assign each deal to the associated reporting entities when the insurer "group" is the acquirer. We do not collapse the insurer financials to the "group" level because regulation is most binding at the insurer level and collapsing could introduce noise into the measure of how close each entity is to the threshold.

[15] An insurer in a given state must enroll at least 1,000 people to be considered "credible" and to be subject to MLR regulation at all.

Table 1 reports summary statistics for the key variables used in our analysis. Based on the insurance financial data, 52% of insurer-market-state units fall below the regulatory threshold in the pre-regulation period, and the average MLR distance is 0.04. Insurers that have pre-existing vertical integration structures in the pre-period have lower enrollment and average claim costs than insurers without such structures, but show greater variation. Premiums are similar across the two groups.

Figure 1 shows the composition of insurers' pre-period vertical integration deals in our sample. Targets classified as healthcare providers and services sector (excluding hospitals) account for the largest share, at 55.3% of all targets. Hospitals account for 19.6% of targets and represent the second-largest category. The third-largest category is specialty care (e.g., chiropractic services), which accounts for 8.0% of targets. Retail sector such as pharmacies account for 7.6% of targets. In addition to targets that are directly reimbursed through medical claims, we also include those related to healthcare quality improvement, which is the other numerator component in the MLR calculation, although these expenditures account for only 0.6% of claim costs. Examples include consulting and software firms and leisure-related businesses (e.g., fitness).

3.2. Research Design

We conduct difference-in-differences (DiD) analysis to examine whether noncompliant insurers are more likely to raise costs through transactions with vertically integrated entities. Specifically, we estimate the following DiD regression separately for insurers with pre-period vertical integration deals (VI group) and those without pre-period vertical integration deals (non-VI group). We also estimate a triple difference regression with a pooled sample of the VI and Non-VI groups to examine whether the difference in coefficients between the two groups is significant:

$$
\begin{aligned}
\Delta\ Costs_{imst} =& \beta_0 + \beta_1 MLR\ Dist_{ims} \times Post_t + \delta_{ims} + \beta_2 X_{imst} + \tau_t + \epsilon_{imst} \quad (a) \\
\Delta\ Costs_{imst} =& \beta_0 + \beta_1 MLR\ Dist_{ims} \times Post_t \times VI_i \\
&+ \beta_2 MLR\ Dist_{ims} \times Post_t + \beta_3 Post_{it} \times VI_i \\
&+ \beta_4 X_{imst} + \delta_{ims} + \tau_t + \epsilon_{imst} \quad (b)
\end{aligned}
\tag{1}
$$

The unit of observation is the insurer (i)–market segment (m)–state (s)–year (t). Standard errors are clustered at the insurer level. In the first DiD model, $\Delta Costs_{imst}$ is the change in the natural logarithm of average reimbursements for insurer i in market segment m in state s between year $t-1$ and year t. This measures the rate of change in claim costs in the current period. $MLR\ Dist_{\text{ims}}$ is a time-invariant variable, which is defined as the distance of the insurer's average medical loss ratio (MLR) from the regulatory threshold in the pre-regulation period if the MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. In the triple difference model (i.e., Eq. 1(b)), VI_i is an indicator equal to 1 if insurer i has vertical integration deals in the pre-period, and 0 otherwise.

X_{imst} controls for insurance enrollment for each unit, given that insurers with large enrollment may have more bargaining power with healthcare providers and hence lower changes in claim cost. δ_{ims} denotes insurer $\times$ market $\times$ state fixed effects. This term controls for time-invariant characteristics of each insurer within a market–state, reflecting differences in insurer-specific characteristics as well as regulatory frameworks and institutional arrangements at the market–state level for each insurer. We include year fixed effects, τ_t, to account for common shocks (such as demand shocks) that affect reimbursements in each year.

4. Results

4.1. Changes in Costs and Affiliated Transactions Following MLR Regulation

First, we examine insurers' revealed preference responses to the MLR regulation. From our theoretical framework, we show that the optimal response of value-maximizing noncompliant insurers is to increase affiliated costs to meet the profitability threshold. We validate this prediction by testing whether noncompliers' costs and affiliated transactions increase following the MLR regulation.

We estimate the difference-in-differences model using $\Delta Costs$, $\Delta Affiliated\ Transactions$ and $\Delta Unffiliated\ Transactions$ as the dependent variables. We use the treatment variable (i.e., *MLR Dist* or *MLR Dist Indicator*) interacted with the *Post* indicator as the main independent variable. Table 2, Panel A presents results when using $\Delta Costs$ as the main dependent variable and shows a positive. We document statistically significant coefficients on $MLR\ Dist\ Indicator \times Post$ and $MLR\ Dist \times Post$ (Column (1): coef. $= 0.047$; $t = 2.97$; Column (2): coef. $= 0.775$; $t = 5.78$). Economically, the coefficient estimate in Column (1) implies that, relative to insurer–market–state units meeting the regulatory threshold, an average noncompliant insurer increases costs by an additional 4.7% in the post-regulation period. The coefficient estimate in Column (2) implies that a one-standard-deviation increase in $MLR\ Dist$ is associated with 4.4% cost increase in the post-regulation period.[16] [17] This finding supports our model's prediction that raising costs for noncompliant insurers is the preferred response to the regulation.

Next, we examine whether noncompliant insurers significantly increase their affiliated transactions. We obtain data on insurers' transactions with affiliates. The data is available at the insurer-year level, for we take the weighted average of $MLR\ Dist$ at the insurer-year level, and estimate the pooled effect on the affiliated transaction changes. Table 2,

[16] 4.4% is calculated as 0.775×0.057, where 0.775 is the coefficient on $MLR\ Dist \times Post$, 0.057 is the standard deviation of $MLR\ Dist$ in the corresponding regression sample.

[17] This magnitude is comparable to the estimates of Cicala et al. (2019), who document that medical claims costs rise by 7% in the individual market and 2% in the group market.

Panel B Column (1) presents results using Δ*Affiliated Transactions* as the dependent variable, and the coefficient on $MLR\ Dist\ (Insurer) \times Post$ is significantly positive (coef. = 1.010; $t = 2.05$). In economic terms, this implies that, a one-standard-deviation increase in the weighted insurer-level MLR distance from the threshold is associated with a 3.9% increase in transactions with affiliated entities.[18] In contrast, in Column (2), the coefficient on $MLR\ Dist \times Post$ is negative and insignificant (coef. = -0.172; $t = 0.33$). This suggests that the cost increase documented in Panel A is driven by an increase in affiliated transaction. Moreover, the results suggest substitution between transactions with affiliated and unaffiliated entities. One possible explanation is that noncompliant insurers shift plan coverage toward affiliated entities, which reduces average per-enrollee payments to unaffiliated providers.

These results suggest that noncompliant insurers significantly increase average costs and affiliated transactions following the regulation, consistent with our prediction in ***H1***. These findings implies that noncompliant insurers are more likely to increase costs through vertically integrated entities—an implication that we will examine in the next section.

4.2. Vertical Integration and Increases in Healthcare Costs

In this section, we next corroborate the mechanism of cost inflation through vertically integrated entities. In addition, compared to the pooled insurer-level affiliated transaction change estimates, gauge the effect on costs at the level at which the regulation is binding (i.e., insurer-market-state-year). Specifically, we test whether noncompliant insurers with vertical integration deals in the pre-regulation period experience a larger increase in costs compared to noncompliant ones with no vertical integration deals in the pre-period.[19]

[18] 3.9% is calculated as 1.010×0.039, where 1.010 is the coefficient on $MLR\ Dist \times Post$, 0.039 is the standard deviation of $MLR\ Dist\ (Insuer)$ in the corresponding regression sample.

[19] One assumption underlying this test is that noncompliant insurers without pre-existing vertical integration require time to identify targets, arrange financing, and complete deals, as well as to tailor target selection toward inflating costs in the specific states and markets in which they fall short of the profitability threshold. The short post-period in our sample helps with this identification strategy, and the patterns in Figure 4 are consistent with this assumption. In addition, vertical integration is not costless: insurers face a trade-off between the costs of undertaking vertical integration and the potential benefits of regulatory circumvention

Columns (1) and (2) of Table 3 show the coefficient estimates using the subsamples of insurers that do and do not have any vertical integration deal before 2011, respectively. We see that, following the MLR regulation, insurers below the regulatory threshold increase their costs significantly, as shown by the positive and significant coefficient estimates of the variable $MLR\ Dist \times Post$ in Columns (1) and (2). The coefficients in Columns (1) and (2) indicate that insurers that are vertically integrated in the pre-regulation period increase their cost growth more (Column (1): coef. $= 0.883$, $t = 7.60$; Column (2): coef. $= 0.243$, $t = 0.80$), and this difference is significant at the 5% level, as shown by the coefficient of $MLR\ Dist \times Post \times VI$ in Column (3). In economic terms, Column (1) suggests that, among units with pre-existing vertical integration, a one-standard-deviation increase in distance from the profitability threshold is associated with an additional annual cost increase of 5.7%, which translates to \$159.6 per enrollee per year.[20] This magnitude is 6.2 times larger than the corresponding effect for units without a pre-existing vertical integration structure.

A fundamental assumption of the difference-in-differences design is that, absent the ACA regulation, differences in cost change across insurers would not have emerged. To assess the validity of this parallel trends assumption in out context, we examine the dynamics of vertical integration in event time. Figure 2 plots the coefficients on $MLR\ Dist \times Year$ for the years surrounding the regulation, along with 95% confidence intervals. We exclude year -1 as the reference period, so the plotted coefficients reflect changes in vertical integration relative to this baseline.

For both the VI group and the non-VI group (i.e., insurers with and without pre-period vertical integration), we observe that the estimates on $MLR\ Dist \times Year$ in the pre-period are insignificant. For the VI group, the cost changes of noncompliant insurers significantly increase compared to compliant insurers, and we also document a persistent

and any efficiency gains.

[20] 5.7% is calculated as: $5.7\% = 0.883 \times 0.064$, where 0.883 is coefficient on $MLR\ Dist \times Post$, and 0.064 is the standard deviation of $MLR\ Dist$ in the corresponding regression sample. \$159.6 is calculated as: $\$159.6 = 5.7\% \times 2.80 \times 1000$, where 2.80 is the average claim cost for VI insurers (in thousands).

increase in average claim costs in the three years following the regulation. For the non-VI group, we document an slight increase in cost changes, but it is insignificant, and the magnitude is much smaller than the VI group estimates. Collectively, these results support the parallel trends assumption and suggest that the observed increase in vertical integration is driven by the ACA regulation rather than by spurious trends.

To cross-sectionally examine whether insurers with different distances to the profit cap behave differently, in Figure 3, we plot the estimates of the coefficient $MLR\ Dist\ Indicator \times Post$ for different terciles of noncompliant insurers.[21] All noncompliant insurers are sorted based on their distance to the MLR standard, with T1 being the group closest to the MLR threshold. The coefficient estimates are positive and significant across all three terciles of the VI insurers. Moreover, the coefficient estimate is largest for the T3 group, which is farthest from the threshold—or the most profitable. This pattern arises because the MLR threshold strictly binds for all insurers. The most profitable VI insurers therefore have the strongest incentive to increase their claim costs to their affiliated providers so that they can pay fewer rebates while still retaining a large portion of their profits within the consolidated group.

In contrast, the coefficient estimates for non-VI insurers are not statistically significant at the 5% level across all groups. The estimated magnitudes are similar across the three groups, consistent with a limited ability to inflate costs in the absence of a pre-existing vertical integration structure. We do, however, observe a comparatively narrower confidence interval for the group that is farthest from the threshold, suggesting they have stronger incentives to reduce rebate payments.[22]

[21] We use a binary treatment indicator in this table, rather than the continuous measure, to make the magnitude comparisons more straightforward, since the continuous measure is mechanically larger in higher terciles.

[22] Figure 4 shows that non-VI insurers increase their likelihood of undertaking deals significantly in the final year of our sample period, which helps reconcile the modest increase in costs observed in this group.

4.3. Vertical Integration and Cost Increase by Market Segments

Next, we examine heterogeneity in cost increases attributable to vertically integrated structures in the individual and group insurance market segments. Research shows that individuals have weaker bargaining power compared to employer groups in healthcare service price contracting (Dafny, 2010; Cicala et al., 2019). This asymmetry in negotiation power suggests that the individual market segment may exhibit a more pronounced increase in average costs through the vertically integrated structure.

In Table 4, we analyze changes in costs within the individual and group insurance market segments, respectively. Columns (1)–(2) and (4)–(5) present the results from estimating the regression in Eq. (1a) separately for the individual and group market segments. The results in Column (1) suggest that, in the individual market, noncompliant insurers with pre-period vertical integration deals significantly increase costs following the regulation (coef. = 1.050; $t = 3.09$). In economic terms, this indicates that among insurer-market-state units with pre-existing vertical integration, one-standard-deviation increase in MLR distance from regulatory threshold is associated with a 7.3% increase for noncompliant units compared 4 to compliant ones, translating to \$167.2 per enrollee per year.[23]

In contrast, the results in Column (2) show that the cost growth of noncompliant insurers with no pre-existing vertical integration structure following the regulation is insignificant (coef. = 0.239; $t = 0.43$), and the economic magnitude is 6.1 smaller than that in Column (1). In addition, the difference between Column (1) and Column (2) is significant at the 10% level, as reported in Column (3). The comparison between Columns (1) and (2) confirms that the cost growth of noncompliant insurers is channeled through the vertically integrated structure. In addition, the magnitude of the coefficient in Column (1) is 1.3 times the magnitude in the sample where the markets are pooled (i.e., Column (1) in Table 3).

[23] 7.3% is calculated as: $7.3\% = 1.050 \times 0.070$, where 1.050 is coefficient on $MLR\ Dist \times Post$, and 0.070 is the standard deviation of $MLR\ Dist$ in the corresponding regression sample. \$167.2 is calculated as: $\$167.2 = 7.3\% \times 2.29 \times 1000$, where 2.29 is the average claim cost in the individual market for VI insurers (in thousands).

Results in Column (4) show that, in the group market, noncompliant insurers with pre-period vertical integration deals significantly increase costs following the regulation as well (coef. = 0.784; $t = 4.96$), which is larger in magnitude and more statistically significant than the estimate for noncompliant insurers without pre-period vertical integration deals in Column (5) (coef. = 0.232; $t = 0.90$). Comparing Columns (1) and (4), the magnitude of the estimated cost increase in the individual market is 1.5 times the estimated cost increase in the group market. This comparison suggests that the individual market experiences a worse cost increase through insurers' vertically integrated structures. It is consistent with findings in the prior literature that consumers in the individual market have lower bargaining power than those in the group market. And it highlights the greater welfare loss borne by individual enrollees.

4.4. Quantity Change Following the MLR Regulation

Insurers' strategic inflation of reimbursement payments is not a costless internal transfer. It imposes financial externalities on consumers through standard cost-sharing arrangements between patients and insurers. In this section, we examine the economic consequences for patients of noncompliant insurers' strategic response to the regulation.

4.4.1. Medical Treatment Quantity

We examine whether and how the increase in price is passed on to consumers. Specifically, the increase in healthcare reimbursement costs induced by vertical integration is not merely a cost transfer from the insurer to the healthcare provider; it also affects patients through increases in coinsurance. As a consequence, patients reduce treatment utilization and the quantity of medical treatments.

We use American Hospital Association (AHA) Annual Survey to examine patient outcomes. The AHA Annual Survey is a widely used hospital-level database that provides broad coverage of U.S. hospitals and serves as a key source for hospital statistics. It contains comprehensive information on organizational characteristics, services, utilization, and

staffing, including measures relevant to outpatient care.

Column (1) of Table 5 reports the estimates for insurers with pre-period vertical integration deals with hospitals. We document a significantly negative coefficient on $MLR\ Dist \times Post$ ($coef = -1.026;\ t = -4.31$). This result suggests that for insurers with pre-period vertical integration deals with hospitals, a one-standard-deviation increase in state-level MLR distance is associated with a 2.4% decrease in medical treatment quantity of the patient.[24] In contrast, in Column (2), for insurers with no pre-period vertical integration deals with hospitals and matched with placebo state-average quantity changes, the magnitude of coefficient on $MLR\ Dist \times Post$ is insignificant and the magnitude is much smaller than the one in Column (1) ($coef = 0.027;\ t = 1.05$).

4.4.2. Insurance Enrollment

Having established that patients decrease their medical treatment quantity more when they live in areas with high market concentration of insurers that were vertically integrated before the ACA, we next examine whether this decrease is driven by the decrease in their insurance enrollment, or the decrease in their insurance utilization.

To test this, we re-estimate the difference-in-differences model specified in Eq. 1 using $\Delta Enrollment$ as the dependent variable. Columns (1) and (2) of Table 6 show the coefficient estimates using the subsamples of insurers that do and do not have any vertical integration deals in the pre-regulation period. We see that, following the MLR regulation, there is no significant change in enrollment for non-compliant insurers with or without pre-existing vertical integration deals (Column (1): coef. $= 0.127$; $t = 0.41$; Column (2): coef. $= 0.127$; $t = 0.29$). The magnitudes calculated from these coefficients are also small. Specifically, a one-standard-deviation increase in $MLR\ Dist$ in Column (1) is associated with 0.8% enrollment decrease, and a one-standard-deviation increase in $MLR\ Dist$ in Column (2) is

[24] -2.4% is calculated as 0.03×-1.026, where -1.026 is the coefficient on $MLR\ Dist \times Post$, and 0.03 is the standard deviation of $MLR\ Dist$ in the corresponding regression sample.

associated with 0.5% enrollment increase.[25]

These findings suggest that, following cost inflation by noncompliant insurers after the profitability regulation was implemented, enrollees did not substantially reduce enrollment with these insurers. This finding is consistent with prior literature showing that switching and search costs create frictions in insurance markets (e.g., Schut and Hassink (2002)), particularly before the introduction of individual and group insurance exchanges.

4.5. Do Noncompliant Insurers Increase Vertical Integration Deals Following the Regulation?

In the previous sections, we've documented cost inflation through vertical integration structure in the pre-regulation period. However, it remains unclear whether noncompliant insurers also increase vertical integration as a response to the regulation, both for insurers with and without pre-existing vertical integration structure. For those with pre-existing vertical integration structure, they may face constraint in cost inflation because of limited channels of profit shifting.[26] For insurers without pre-existing vertical integration structure, they have stronger incentives to undertake vertical integration deals to tailor target selection toward inflating costs in the specific states and markets in which they fall short of the profitability threshold. However, they also face a trade-off between the costs of undertaking vertical integration and the potential benefits of regulatory circumvention and any efficiency gains.

To test this, we re-estimate the difference-in-differences model specified in Eq. 1 using *Deal Indicator* as the dependent variable. Columns (1) and (2) of Table 6 show the coefficient estimates using the subsamples of insurers that do and do not have any vertical integration deals in the pre-regulation period. In Column (1), we see that following the MLR

[25] -0.8% is calculated as -0.127×0.064, where -0.127 is the coefficient on $MLR\ Dist \times Post$, 0.064 is the standard deviation of $MLR\ Dist$ in the corresponding regression sample. 0.5% is calculated as 0.127×0.039, where 0.127 is the coefficient on $MLR\ Dist \times Post$, 0.039 is the standard deviation of $MLR\ Dist$ in the corresponding regression sample.

[26] For example, an insurers may operate in different states. It may have vertically integrated healthcare entities operating in one state, but this makes it hard for them to inflate costs in another state to avoid exceeding the profitability threshold.

regulation, the effect on deal likelihood for non-compliant insurers with pre-existing vertical integration deals is insignificant (coef. $= 0.128$; $t = 0.96$). In Column (2), we show that non-compliant insurers without pre-existing vertical integration deals significantly increase their likelihood of undertaking vertical integration deals after the regulation (coef. $= 0.794$; $t = 5.08$). In economic terms, an average noncompliant insurer with no pre-period vertical integration is 23.8% more likely to vertically integrate after regulation.[27]

To more clearly characterize the dynamics of vertical integration around the regulation, we estimate an event-study specification in which the dependent variable is a deal indicator and the key regressors are interactions between $MLR\ Dist$ and event-time indicators. Figure 4 shows that noncompliant insurers with pre-existing vertical integration exhibit a moderate increase in deal likelihood in the post-period; the post-3 period estimate (the final period in our sample) is marginally significant at the 5% level. For noncompliant insurers without pre-existing vertical integration, deal likelihood increases sharply in the final period and is statistically significant. This provides additional evidence that cost inflation through vertically integration structure is a preferred action the noncompliant insurers in response to the profitability regulation, which significantly increase their incentives to undertake such deals. They also help reconcile our earlier finding that non-VI insurers do not exhibit a statistically significant increase in costs within the sample window: absent an existing vertical integration structure, this channel is constrained in the short run, and implementing it requires time to identify targets and tailor affiliated-provider arrangements to local market conditions and the insurer's distance from the profitability threshold.

We next examine the expected synergies of these vertical integration deals, proxied by three-day cumulative abnormal returns around the deal announcement date. A statistical comparison indicates that deals announced after the regulation have lower expected synergies

[27] 23.8% is calculated as: $23.8\% = 0.794 \times 0.02 \times 5 \times 3$, where 0.794 is the coefficient on $MLR\ Dist \times Post$, 0.02 is the mean value of $MLR\ Dist$ in the corresponding regression sample, 5 is the average number of insurer entities associated with an insurer's parent entity, and 3 is the number of post-period years in our sample.

than those announced before the regulation, with a z-statistic of 1.68 and a one-tailed p-value below 0.05. These findings suggest that, from shareholders' perspective, post-regulation deals generate weaker value implications than pre-regulation deals, consistent with these transactions being motivated at least in part by incentives to circumvent the profitability regulation, even if their efficiency gains are lower than those of deals that would have been undertaken absent the regulation.

4.6. Robustness

In this section, we show the robustness of our main results in Table 3 using alternative regression specifications. We re-estimate the difference-in-differences model with a binary MLR distance measure and alternative fixed effects.

Table 8 Columns (1) and (2) show the results when we re-estimate Eq. 1a with an alternative fixed-effects structure. Specifically, we include insurer-market-state, and market-year fixed effects to control for intertemporal changes in each market. We document an additional 5.7% increase in average costs for a one-standard-deviation increase in distance from the threshold among noncompliant insurers with pre-period vertically integrated structures. This magnitude is 6.2 times larger than that for noncompliant insurers with no pre-period vertically integrated structures (Column (1): coef = 0.883; t = 7.60; Column (2): coef = 0.243; t = 0.80).

Table 8 Columns (3) and (4) report the results when we re-estimate Eq. 1a with a binary MLR distance measure as the independent variable. Column (3) presents results for insurers with pre-regulation vertical integration deals. We continue to observe a positive and significant effect on costs for noncompliant insurers (coef = 0.058; t = 3.05). In economic terms, noncompliant insurers have an additional 5.8% increase in costs. Column (4) presents results for insurers without pre-regulation vertical integration deals, where we document an increase in costs for noncompliant insurers, but the magnitude is 2.23 times smaller compared to the estimates in the third column and is insignificant at the 5% level (coef = 0.026; t = 1.13).

5. Conclusion

This paper documents insurers' strategic behaviors in response to the Affordable Care Act's medical loss ratio (MLR) regulation. Using statutory filings and patient claims, we show that insurers that are vertically integrated with healthcare providers immediately redirect a large share of medical spending to their subsidiaries post regulation. These shifts increase insurers' MLR ratios above the regulatory threshold while keeping profits inside the consolidated insurer group. We also show that this effect is more pronounced in the individual market, where individual consumers have less negotiating power than employer groups. Event-study and difference-in-differences estimates confirm that the effects are robust, economically sizable, and not explained by pre-existing trends or common shocks.

Further, we show the negative economic consequences of vertical integration for patients, as treatment quantity decreases. Together, these findings suggest the need for closer regulatory scrutiny of vertical integration and its impact on both healthcare spending and patient welfare. Our evidence highlights affiliated transactions enable firms to inflate transfer prices and, as a result, report higher claim costs. By tying granular cost components to differences in ownership, we show how healthcare conglomerates inflate costs to comply with profit caps in ways that harm consumers. They suggest a greater need to scrutinize the internal flow of funds within insurance groups. For regulators contemplating new vertical integration guidelines or broader antitrust scrutiny, our findings provide quantitative benchmarks of the welfare stakes at issue, highlighting the need for merger review standards that incorporate strategic transfer pricing and its downstream impact on patients.

References

Acemoglu, Daron, Simon Johnson, and Todd Mitton. "Determinants of vertical integration: financial development and contracting costs." *The Journal of Finance* 64, no. 3 (2009): 1251-1290.

Alexander, Diane, and Molly Schnell. 2024. The impacts of physician payments on patient access, use, and health. *American Economic Journal: Applied Economics* 16 (3): 142–177.

Alfaro, Laura, Paola Conconi, Harald Fadinger, and Andrew F. Newman. 2016. Do prices determine vertical integration? *The Review of Economic Studies* 83 (3): 855–888.

Baldenius, Tim, Nahum D. Melumad, and Stefan Reichelstein. 2004. Integrating managerial and tax objectives in transfer pricing. *The Accounting Review* 79, no. 3: 591-615.

Ballew, Hailey, Michael Iselin, and Allison Nicoletti. "Accounting-based thresholds and growth decisions in the banking industry." *Review of Accounting Studies* 27, no. 1 (2022): 232-274.

Berger, Philip G., and Rebecca N. Hann. 2007. Segment profitability and the proprietary and agency costs of disclosure. *The Accounting Review* 82 (4): 869–906.

Bernard, Andrew B., J. Bradford Jensen, and Peter K. Schott. 2006. Transfer Pricing by U.S.-Based Multinational Firms *NBER Working Paper* 12493.

Brickley, James A., James S. Linck, and Clifford W. Smith. "Vertical integration to avoid conxtracting with potential competitors: Evidence from bankers' banks." *Journal of Financial Economics* 105, no. 1 (2012): 113-130.

Brot-Goldberg, Zarek C., Catherine Che, and Benjamin R. Handel. Pharmacy benefit managers and vertical relationships in drug supply: state of current research. *Working Paper*

Brown, Jeffrey R., and Amy Finkelstein. "The interaction of public and private insurance: Medicaid and the long-term care insurance market." *American Economic Review* 98, no. 3 (2008): 1083-1102.

Case, Anne, Ingrid Le Roux, and Alicia Menendez. 2004. Medical compliance and income-health gradients. *American Economic Review* 94 (2): 331–335.

Centers for Medicare & Medicaid Services. 2023. "National Health Expenditure Fact Sheet." https://www.cms.gov/data-research/statistics-trends-and-reports/national-health-expenditure-data/nhe-fact-sheet.

Cicala, Steve, Ethan M. J. Lieber, and Victoria Marone. 2019. Regulating markups in US health insurance. *American Economic Journal: Applied Economics* 11 (4): 71–104.

Cooper, Zack, Stuart V. Craig, Aristotelis Epanomeritakis, Matthew Grennan, Joseph R. Martinez, Fiona Scott Morton, and Ashley T. Swanson. 2025. *Are Hospital Acquisitions of Physician Practices Anticompetitive?* NBER Working Paper No. w34039.

Dafny, Leemore S. 2010. Are health insurance markets competitive? *American Economic Review* 100 (4): 1399–1431.

Dieleman, Joseph L., Meera Beauchamp, Sawyer W. Crosby, Drew DeJarnatt, Emily K. Johnson, Haley Lescinsky, Theresa McHugh, et al. 2025. Tracking US health care spending by health condition and county. *JAMA* 333 (12): 1051–1061.

U.S. Department of Justice and the Federal Trade Commission. 2023. "Merger Guidelines." https://www.justice.gov/d9/2023-12/2023%20Merger%20Guidelines.pdf.

Eastman, Evan M., David L. Eckles, and Andrew Van Buskirk. 2021. Accounting-based regulation: Evidence from health insurers and the Affordable Care Act. *The Accounting Review* 96 (2): 231–259.

Eliason, Paul J., Paul L. E. Grieco, Ryan C. McDevitt, and James W. Roberts. 2018. Strategic patient discharge: The case of long-term care hospitals. *American Economic Review* 108 (11): 3232–3265.

Eliason, Paul J., Benjamin Heebsh, Ryan C. McDevitt, and James W. Roberts. 2020. How acquisitions affect firm behavior and performance: Evidence from the dialysis industry. *The Quarterly Journal of Economics* 135 (1): 221–267.

Fathollahi, Maryam, Jarrad Harford, and Sandy Klasa. 2022. Anticompetitive effects of horizontal acquisitions: The impact of within-industry product similarity. *Journal of Financial Economics* 144 (2): 645–669.

Frésard, Laurent, Gerard Hoberg, and Gordon M. Phillips. "Innovation activities and integration through vertical acquisitions." *The Review of Financial Studies* 33, no. 7 (2020): 2937-2976.

Grossman, Sanford, and D. Oliver. 1986. The costs and benefits of ownership: a theory of vertical and lateral integration. *Journal of Political Economy* 94 (4): 691–719.

Guo, Dongxian, Li Liu, and Tim Schmidt-Eisenlohr. 2017. International transfer pricing and tax avoidance: Evidence from linked trade–tax statistics in the UK. *International Finance Discussion Papers* 1214.

Gupta, Atul, Sabrina T. Howell, Constantine Yannelis, and Abhinav Gupta. 2024. Owner incentives and performance in healthcare: private equity investment in nursing homes. *The Review of Financial Studies* 37 (4): 1029–1077.

Hansman, Christopher, Jonas Hjort, Gianmarco León-Ciliotta, and Matthieu Teachout. 2020. Vertical integration, supplier behavior, and quality upgrading among exporters. *Journal of Political Economy* 128 (9): 3570–3625.

Ho, Katherine. 2009. Insurer-provider networks in the medical care market. *American Economic Review* 99 (1): 393–430.

Hortaçsu, Ali, and Chad Syverson. 2007. Cementing relationships: Vertical integration, foreclosure, productivity, and prices. *Journal of Political Economy* 115 (2): 250–301.

Kepler, John D., Vic Naiker, and Christopher R. Stewart. 2023. Stealth acquisitions and product market competition. *The Journal of Finance* 78 (5): 2837–2900.

Lafontaine, Francine, and Margaret Slade. 2007. Vertical integration and firm boundaries: The evidence. *Journal of Economic Literature* 45 (3): 629–685.

Lee, Robin S., Michael D. Whinston, and Ali Yurukoglu. 2021. Structural empirical analysis of contracting in vertical markets. In *Handbook of Industrial Organization*, vol. 4, no. 1, 673–742. Elsevier.

Leuz, Christian, and Peter D. Wysocki. "The economics of disclosure and financial reporting regulation: Evidence and suggestions for future research." *Journal of Accounting Research* 54, no. 2 (2016): 525-622.

Luco, Fernando, and Guillermo Marshall. 2020. The competitive impact of vertical integration by multiproduct firms. *American Economic Review* 110 (7): 2041–2064.

Papanicolas, Irene, Liana R. Woskie, and Ashish K. Jha. 2018. Health care spending in the United States and other high-income countries. *JAMA* 319 (10): 1024–1039.

Salop, Steven C. 2018. Invigorating vertical merger enforcement. *The Yale Law Journal*: 1962–1994.

Schut, F.T. and Hassink, W.H., 2002. Managed competition and consumer price sensitivity in social health insurance. *Journal of Health Economics*, 21(6), pp.1009-1029.

Shapiro, Carl. 2020. Comment on DOJ/FTC Draft Vertical Merger Guidelines. https://www.ftc.gov/system/files/attachments/798-draft-vertical-merger-guidelines/shapiro_comment_on_draft_vmgs.pdf.

Shenoy, Jaideep. 2012. An examination of the efficiency, foreclosure, and collusion rationales for vertical takeovers. *Management Science* 58 (8): 1482–1501.

Starc, Amanda, and Thomas G. Wollmann. 2025. Does entry remedy collusion? Evidence from the

generic prescription drug cartel. *American Economic Review* 115 (5): 1400–1438.

Weber, David P., and Yanhua Sunny Yang. "The debt-equity choice when regulatory thresholds are based on equity values: Evidence from SOX 404." *The Accounting Review* 95, no. 2 (2020): 339-364.

Wollmann, Thomas G. 2024. How to get away with merger: stealth consolidation and its effects on US healthcare. *NBER Working Paper* No. w27274.

Yde, Eric. 2025. Vertical Integration and Regulated Profits in Pharmacy Benefits Markets. *Working Paper*

Figure 1: **Target Composition of Pre-Period Vertical Integration Deals**

This figure presents the target composition of pre-period vertical integration deals in our sample. The slices and labels are ordered from the highest to the lowest percentage, with colors progressing from darkest to lightest accordingly.

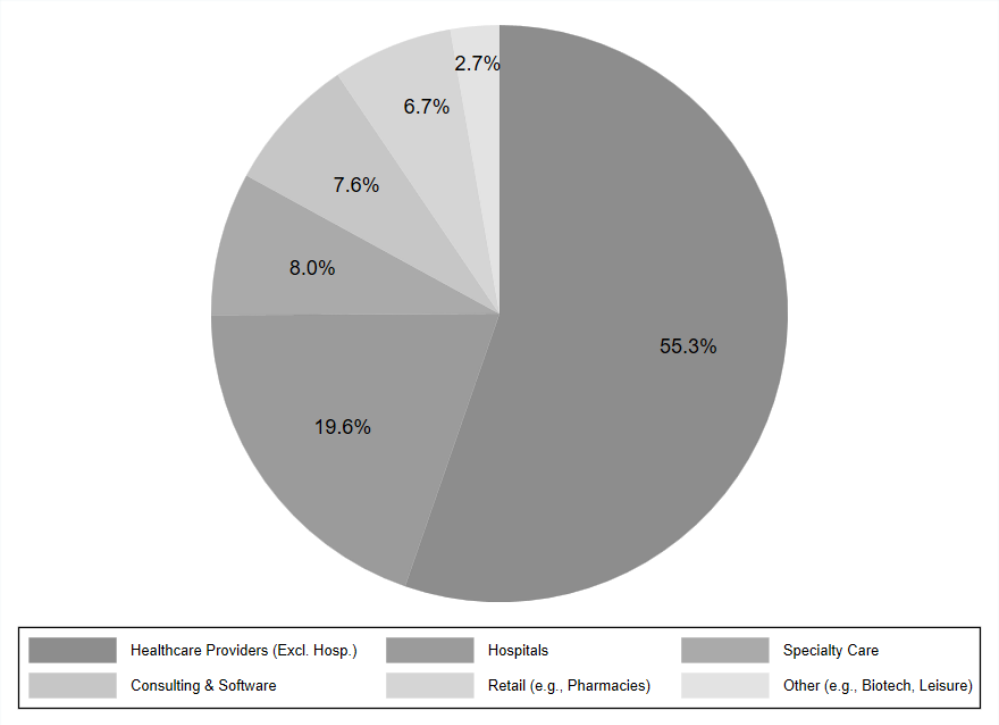


Figure 2: **Cost Change Trends Surrounding MLR Regulation**

This figure presents coefficient estimates and 95% confidence intervals from insurer–state–market–year–level regressions. Blue circles (red triangles) and the corresponding lines show estimates for insurers with (without) vertical integration deals in the pre-regulation period. The dependent variable, $\Delta Costs$, is defined as the change in the natural logarithm of average costs, measured as total reimbursements divided by the number of enrollees for insurer i in state s and market segment m between year $t-1$ and year t. The key independent variables are $MLR\ Dist$ interacted with event-period indicators. $MLR\ Dist$ is defined as the distance of the insurer's average medical loss ratio (MLR) from the regulatory threshold in the pre-regulation period if the MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. The regressions include logged enrollment control variable, insurer × state × market fixed effects and year fixed effects. Standard errors are clustered at the insurer level. See Appendix A for variable definitions.

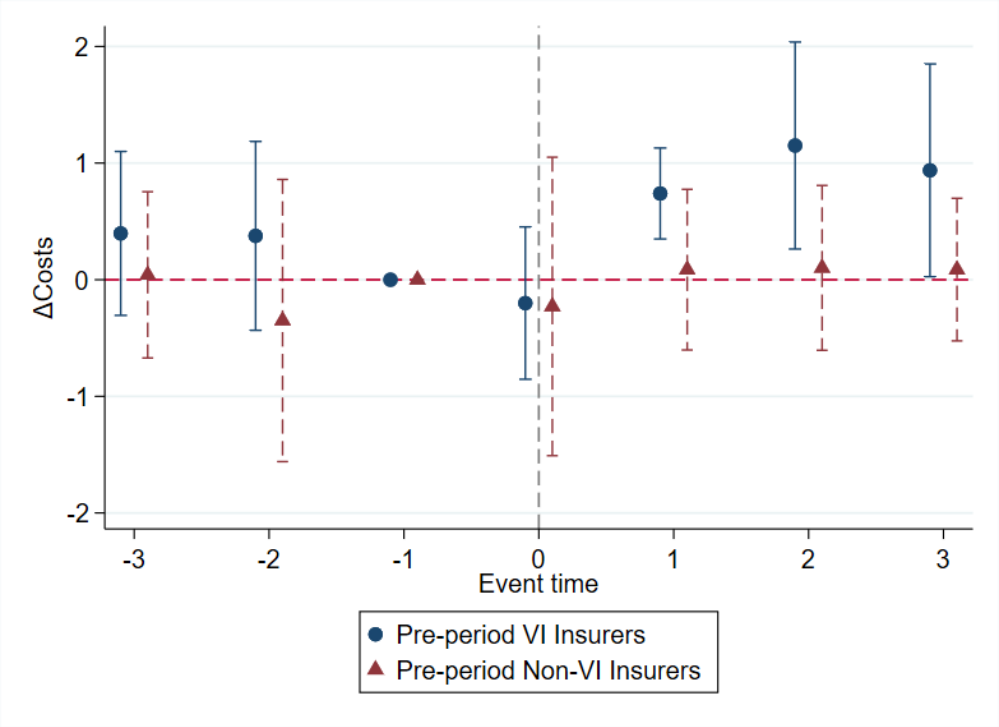


Figure 3: **Cost Change for Different Terciles of MLR Distance**

This figure presents coefficient estimates and 95% confidence intervals from insurer–state–market–year–level regressions. Blue circles (red triangles) and the corresponding lines show estimates for insurers with (without) vertical integration deals in the pre-regulation period. To compare the magnitudes across bins more intuitively, we use $MLR\ Dist\ Indicator$ as the treatment variable in the regressions used to generate this figure. The treated insurers, whose $MLR\ Dist > 0$, are grouped into three terciles. The dependent variable, $\Delta Costs$, is defined as the change in the natural logarithm of average costs (total reimbursements divided by the number of enrollees) for insurer i in state s and market segment m between year $t-1$ and year t. The key independent variable is $MLR\ Dist\ Indicator$, a binary treatment variable interacted with the $Post$ indicator for the post period. $MLR\ Dist\ Indicator$ equals 1 if the pre-period average MLR is lower than the MLR threshold, and 0 otherwise, for each insurer i in state s and market segment m. The regressions include logged enrollment control variable, insurer × state × market fixed effects and year fixed effects. Standard errors are clustered at the insurer level. See Appendix A for variable definitions.

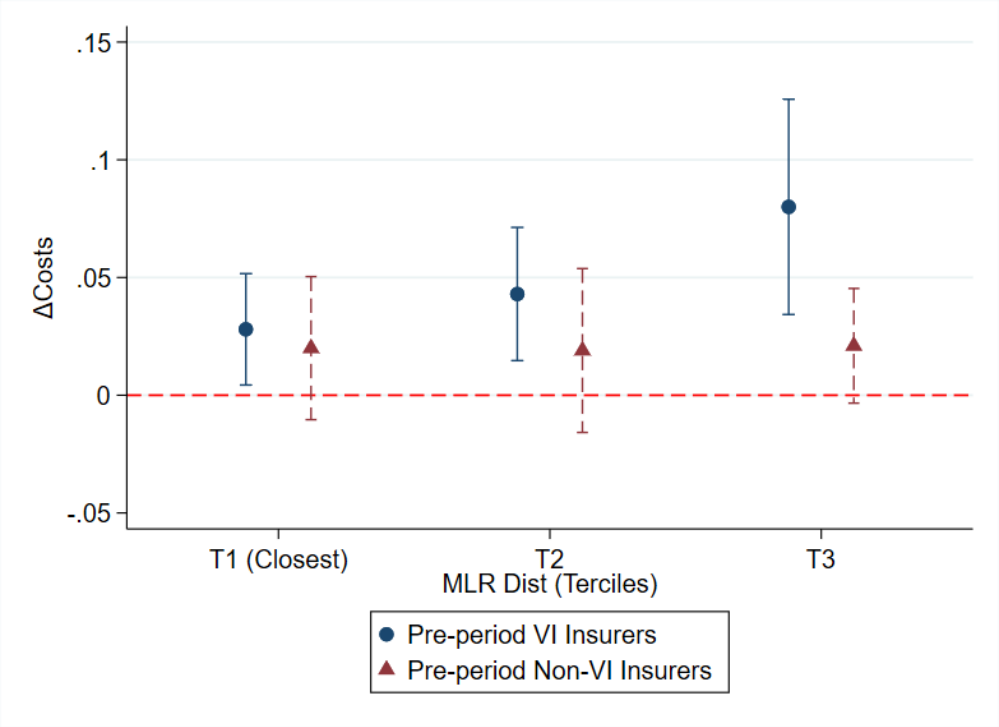


Figure 4: **Vertical Integration Deals Surrounding the MLR Regulation**

This figure presents coefficient estimates and 95% confidence intervals from insurer–state–market–year–level regressions. Blue circles (red triangles) and the corresponding lines show estimates for insurers with (without) vertical integration deals in the pre-regulation period. The dependent variable, *Deal Indicator*, is an indicator equal to 1 if the insurer i undertakes at least one deal in year t, and 0 otherwise. The key independent variables are $MLR\ Dist$ interacted with event-period indicators. $MLR\ Dist$ is defined as the distance of the insurer's average medical loss ratio (MLR) from the regulatory threshold in the pre-regulation period if the MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. The regressions include logged enrollment control variable, insurer × state × market fixed effects and year fixed effects. Standard errors are clustered at the insurer's parent entity level. See Appendix A for variable definitions.

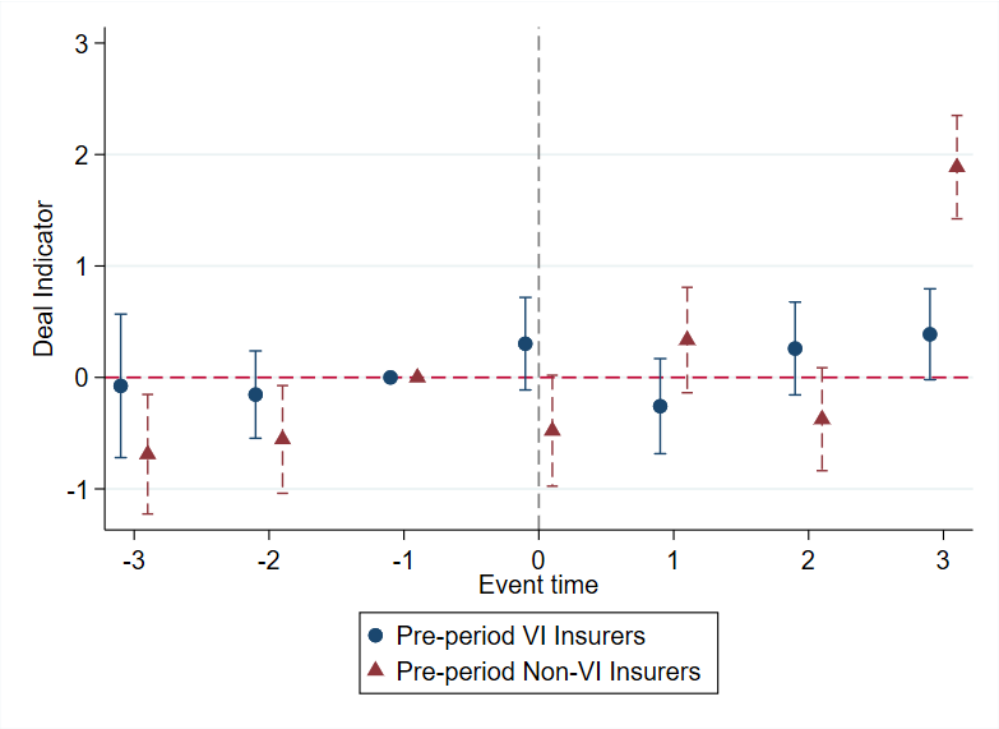


Table 1: **Descriptive Statistics**

This table reports summary statistics for the key variables. The sample period is 2005-2013, excluding 2008 and 2009. Panel A presents summary statistics for the variables used in the regression analyses. Panel B reports summary statistics for insurer characteristics, separately for insurers with and without pre-period vertical integration deals.

Panel A. **Descriptive Statistics of Variables in the Regression Analysis**

Variables	Obs.	Mean	SD	P25	Median	P75
Dependent variables						
ΔCosts	2,802	0.06	0.14	0.00	0.06	0.11
ΔAffiliated Transactions	1,814	0.02	0.44	0.00	0.00	0.04
ΔUnaffiliated Transactions	1,814	0.12	0.45	0.00	0.05	0.16
ΔCosts (Individual Market)	591	0.05	0.17	-0.01	0.06	0.14
ΔCosts (Group Market)	2,211	0.06	0.13	0.01	0.06	0.11
ΔEnrollment	2,802	-0.05	0.35	-0.18	-0.04	0.07
Deal Indicator	2,802	0.23	0.42	0.00	0.00	0.00
Independent variables						
MLR Dist	2,802	0.04	0.06	0.00	0.00	0.05
MLR Dist Indicator	2,802	0.52	0.50	0.00	1.00	1.00
Post	2,802	0.43	0.49	0.00	0.00	1.00
VI	2,802	0.66	0.47	0.00	1.00	1.00
Ln Enrollment	2,802	10.02	1.46	8.97	10.04	11.06
MLR Dist (Insurer)	1,814	0.03	0.04	0.00	0.01	0.04
MLR Dist (Individual Market)	591	0.04	0.06	0.00	0.00	0.06
MLR Dist (Group Market)	2,211	0.03	0.06	0.00	0.01	0.05
Ln Enrollment (Individual Market)	591	9.52	1.26	8.53	9.61	10.41
Ln Enrollment (Group Market)	2,211	10.16	1.48	9.16	10.15	11.19

Panel B. **Descriptive Statistics of Key Insurer Characteristics**

Variables	Obs.	Mean	SD	P25	Median	P75
Pre-period VI insurers						
Number of VI insurers	206					
MLR Distance	1,854	0.04	0.06	0.00	0.02	0.06
Enrollment (in thousands)	1,854	53.49	96.67	7.11	20.24	52.63
Average Cost (in thousands)	1,854	2.80	1.22	2.14	2.87	3.51
Average Premium (in thousands)	1,854	3.34	1.37	2.61	3.49	4.19
ΔCosts	1,854	0.06	0.15	-0.00	0.06	0.12
Pre-period Non-VI insurers						
Number of non-VI insurers	107					
MLR Distance	948	0.02	0.04	0.00	0.00	0.03
Enrollment (in thousands)	948	71.59	109.71	10.57	28.63	78.78
Average Cost (in thousands)	948	2.93	1.05	2.32	2.94	3.56
Average Premium (in thousands)	948	3.46	1.18	2.78	3.48	4.23
ΔCosts	948	0.06	0.12	0.01	0.05	0.10

Table 2: **Effect of Profitability Regulation on Costs and Affiliated Transactions**

This table presents results from the difference-in-differences model regressing cost changes, affiliated transactions and unaffiliated transactions on the treatment variable interacted with the *Post* indicator. The unit of observation is insurer–state–market–year in Panel A, and insurer-year in Panel B. In Panel A, the key dependent variable is $\Delta Costs$, defined as the change in the natural logarithm of average costs (total reimbursements divided by the number of enrollees) for insurer i in state s and market segment m between year $t-1$ and year t. The key independent variable is the treatment variable ($MLR\ Dist\ Indicator$ or $MLR\ Dist$) interacted with *Post*. $MLR\ Dist\ Indicator$ is an indicator equal to 1 if the average MLR is below the threshold in the pre-regulation period, and 0 otherwise, for each insurer i in state s and market segment m. $MLR\ Dist$ is defined as the distance of the insurer's average medical loss ratio (MLR) from the regulatory threshold in the pre-regulation period if the MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. Panel A includes insurer × market × state fixed effects and year fixed effects. In Panel B, the key dependent variable is $\Delta(Un)Affiliated\ Transactions$, defined as the change in the natural logarithm of average (un)affiliated transactions for insurer i between year $t-1$ and year t. The key independent variable is the treatment variable $MLR\ Dist\ (Insurer)$ interacted with *Post*. $MLR\ Dist\ (Insurer)$ is the weighted average of $MLR\ Dist$ at the insurer i level, weighted by number of enrollees. t-statistics, reported in parentheses, are based on standard errors clustered at the insurer level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed). See Appendix A for variable definitions.

Panel A. **Regulation Treatment and Cost Change**

Dependent Variable	ΔCosts	
	Binary Treatment	Continuous Treatment
	(1)	(2)
MLR Dist Indicator × Post	0.047***	
	(2.97)	
MLR Dist × Post		0.775***
		(5.78)
Ln Enrollment	0.008	0.004
	(1.08)	(0.58)
Observations	2,802	2,802
R-squared	0.212	0.225
Insurer × Market × State FE	Y	Y
Year FE	Y	Y

Panel B. **Regulation Treatment and (Un)Affiliated Transaction Change**

Dependent Variable	ΔAffiliated Transactions	ΔUnaffiliated Transactions
	(1)	(2)
MLR Dist (Insurer) × Post	1.010**	-0.172
	(2.05)	(-0.33)
Ln Enrollment	0.005	0.080***
	(0.25)	(3.44)
Observations	1,814	1,814
R-squared	0.121	0.165
Insurer × Market × State FE	Y	Y
Year FE	Y	Y

Table 3: **Cost Change through Vertical Integration**

This table presents results from the difference-in-differences model regressing average cost changes on the treatment variable $MLR\ Dist$ interacted with the $Post$ indicator, as well as a triple-difference model where $MLR\ Dist \times Post$ is further interacted with the binary variable VI. The unit of observation is insurer–state–market–year. Columns (1) and (2) report the difference-in-differences estimates using insurers with and without vertical integration deals in the pre-regulation period. Column (3) reports the triple-difference estimates using the full sample. The dependent variable is $\Delta Costs$, defined as the change in the natural logarithm of average costs (total reimbursements divided by the number of enrollees) for insurer i in state s and market segment m between year $t-1$ and year t. $MLR\ Dist$ is defined as the distance of the insurer's average medical loss ratio (MLR) from the regulatory threshold in the pre-regulation period if the MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. VI is an indicator equal to 1 if insurer i has vertical integration deals in the pre-period, and 0 otherwise. All regressions include insurer × market × state fixed effects and year fixed effects. t-statistics, reported in parentheses, are based on standard errors clustered at the insurer level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed). See Appendix A for variable definitions.

Dependent Variable	ΔCosts		
	Pre-period VI	Pre-period Non-VI	All Insurers
	(1)	(2)	(3)
MLR Dist × Post × VI			0.662**
			(2.10)
MLR Dist × Post	0.883***	0.243	0.228
	(7.60)	(0.80)	(0.77)
Post × VI			-0.019
			(-1.30)
Ln Enrollment	0.005	0.004	0.005
	(0.51)	(0.41)	(0.70)
Observations	1,854	948	2,802
R-squared	0.236	0.219	0.227
Insurer × Market × State FE	Y	Y	Y
Year FE	Y	Y	Y

Table 4: **Vertical Integration and Cost Change by Market Segments**

This table presents results from the difference-in-differences model regressing average cost change on the treatment variable $MLR\ Dist$ interacted with the $Post$ indicator, and from a triple-difference model where $MLR\ Dist \times Post$ is interacted with the binary variable VI. The unit of observation is insurer–state–market–year. Columns (1)–(3) present results for the individual market segment, and Columns (4)–(6) present results for the group market segment. Columns (1), (2), (4), and (5) report the difference-in-differences estimates using insurers with and without vertical integration deals in the pre-regulation period. Columns (3) and (6) report the triple-difference estimates using the full sample. The dependent variable is $\Delta Costs$, defined as the change in the natural logarithm of average costs (total reimbursements divided by the number of enrollees) for insurer i in state s and market segment m between year $t-1$ and year t. $MLR\ Dist$ is defined as the distance of the insurer's average medical loss ratio (MLR) from the regulatory threshold in the pre-regulation period if the MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. VI is an indicator equal to 1 if insurer i has vertical integration deals in the pre-period, and 0 otherwise. All regressions insurer × market × state fixed effects and year fixed effects. t-statistics, reported in parentheses, are based on standard errors clustered at the insurer level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed). See Appendix A for variable definitions.

Dependent Variable	ΔCosts (Individual Market)			Δ Costs(Group Market)		
	Pre-period VI	Pre-period Non-VI	All Insurers	Pre-period VI	Pre-period Non-VI	All Insurers
	(1)	(2)	(3)	(4)	(5)	(6)
MLR Dist × Post × VI			1.044*			0.515*
			(1.67)			(1.80)
MLR Dist × Post	1.050***	0.239	0.091	0.784***	0.232	0.268
	(3.09)	(0.43)	(0.17)	(4.96)	(0.90)	(1.06)
Post × VI			-0.009			-0.020
			(-0.17)			(-1.49)
Ln Enrollment	0.051	0.002	0.033	-0.005	0.004	-0.002
	(1.65)	(0.08)	(1.57)	(-0.51)	(0.50)	(-0.25)
Observations	321	270	591	1,533	678	2,211
R-squared	0.241	0.187	0.208	0.245	0.251	0.242
Insurer × Market × State FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

Table 5: **Changes in Medical Treatment Quantity**

This table presents results from the difference-in-differences model regressing medical treatment quantity changes on the treatment variable *MLR Dist* interacted with the *Post* indicator. The unit of observation is insurer–state–market–year. Columns (1) and (2) report the difference-in-differences estimates using insurers with and without vertical integration deals with hospital targets in the pre-regulation period. In Column (1), the dependent variable is $\Delta Quantity$, defined as the change in the natural logarithm of average quantity (weighted outpatient visits, weighted by hospital total expense) for insurer i in state s and market segment m between year $t-1$ and year t. In Column (2), the dependent variable is $\Delta Placebo\ Quantity$, defined as the change in the natural logarithm of average placebo quantity (weighted outpatient visits, weighted by hospital total expense) in the same state and same year for insurer i in state s and market segment m between year $t-1$ and year t. $MLR\ Dist$ is defined as the distance of the insurer's average medical loss ratio (MLR) from the regulatory threshold in the pre-regulation period if the MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. All regressions include insurer × market × state fixed effects and year fixed effects. t-statistics, reported in parentheses, are based on standard errors clustered at the insurer level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed). See Appendix A for variable definitions.

Dependent Variable	ΔQuantity Binary Treatment (1)	ΔPlacebo Quantity Continuous Treatment (2)
MLR Dist × Post	-1.026***	0.027
	(-4.31)	(1.05)
Ln Enrollment	0.043*	-0.000
	(1.74)	(-0.06)
Observations	275	2,845
R-squared	0.144	0.180
Insurer × Market × State FE	Y	Y
Year FE	Y	Y

Table 6: **MLR Distance and Enrollment**

This table presents results from the difference-in-differences model regressing enrollment changes on the treatment variable $MLR\ Dist$ interacted with the $Post$ indicator, as well as a triple-difference model where $MLR\ Dist \times Post$ is further interacted with the binary variable VI. The unit of observation is insurer–state–market–year. Columns (1) and (2) report the difference-in-difference estimates using insurers with and without vertical integration deals in the pre-regulation period. Column (3) reports the triple-difference estimates using the full sample. The dependent variable is $\Delta Enrollment$, defined as the change in the natural logarithm of enrollment for insurer i in state s and market segment m between year $t-1$ and year t. $MLR\ Dist$ is defined as the distance of the insurer's average medical loss ratio (MLR) from the regulatory threshold in the pre-regulation period if the MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. VI is an indicator equal to 1 if insurer i has vertical integration deals in the pre-period, and 0 otherwise. All regressions include insurer $\times$ market $\times$ state fixed effects and year fixed effects. t-statistics, reported in parentheses, are based on standard errors clustered at the insurer level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed). See Appendix A for variable definitions.

Dependent Variable	ΔEnrollment		
	Pre-period VI	Pre-period Non-VI	All Insurers
	(1)	(2)	(3)
MLR Dist × Post × VI			-0.298
			(-0.56)
MLR Dist × Post	-0.127	0.127	0.151
	(-0.41)	(0.29)	(0.35)
Post × VI			0.020
			(0.49)
Observations	1,854	948	2,802
R-squared	0.352	0.392	0.360
Insurer × Market × State FE	Y	Y	Y
Year FE	Y	Y	Y

Table 7: **Effect of Profitability Regulation on Vertical Integration Likelihood**

This table presents results from the difference-in-differences model regressing vertical deal indicator on the treatment variable *MLR Dist* interacted with the *Post* indicator, as well as a triple-difference model where $MLR\ Dist \times Post$ is further interacted with the binary variable VI. The unit of observation is insurer–state–market–year. Columns (1) and (2) report the difference-in-difference estimates using insurers with and without vertical integration deals in the pre-regulation period. Column (3) reports the triple-difference estimates using the full sample. The dependent variable is *Deal Indicator*, defined as an indicator equal to one if insurer i or its parent entity acquires any target firm in a vertical integration deal in year t. *MLR Dist* is defined as the distance of the insurer's average medical loss ratio (MLR) from the regulatory threshold in the pre-regulation period if the MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. VI is an indicator equal to 1 if insurer i has vertical integration deals in the pre-period, and 0 otherwise. All regressions include insurer × market × state fixed effects and year fixed effects. t-statistics, reported in parentheses, are based on standard errors clustered at the insurer's parent entity level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed). See Appendix A for variable definitions.

Dependent Variable	Deal Indicator		
	Pre-period VI	Pre-period Non-VI	All Insurers
	(1)	(2)	(3)
MLR Dist × Post × VI			-0.757**
			(-2.47)
MLR Dist × Post	0.128	0.794***	0.797***
	(0.96)	(5.08)	(2.88)
Post × VI			0.169
			(1.32)
Ln Enrollment	-0.005	-0.001	-0.004
	(-1.13)	(-0.18)	(-1.20)
Test: $z[H_0:$ CAR around the deal ann. date in the pre-period < post-period$] = 1.68,\ p < 0.05$			
Observations	1,854	948	2,802
R-squared	0.757	0.241	0.771
Insurer × Market × State FE	Y	Y	Y
Year FE	Y	Y	Y

Table 8: **Robustness**

This table presents results from the difference-in-differences model regressing cost change on the treatment variable (continuous or binary) interacted with the *Post* indicator. The unit of observation is insurer–state–market–year. The dependent variable is $\Delta Costs$, defined as the change in the natural logarithm of average costs (total reimbursements divided by the number of enrollees) for insurer i in state s and market segment m between year $t-1$ and year t. In Columns (1)–(2), $MLR\ Dist$ is the distance between the average MLR and the threshold if the average MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. In Columns (3)–(4), $MLR\ Dist\ Indicator$ is an indicator variable equal to 1 if the average MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. Columns (1) and (2) include insurer × market × state fixed effects and market × year fixed effects. Columns (3) and (4) include insurer × market × state fixed effects and year fixed effects. t-statistics, reported in parentheses, are based on standard errors clustered at the insurer level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed). See Appendix A for variable definitions.

Dependent Variable	ΔCosts			
	Pre-period VI	Pre-period Non-VI	Pre-period VI	Pre-period Non-VI
	(1)	(2)	(3)	(4)
MLR Dist × Post	0.883***	0.243		
	(7.60)	(0.80)		
MLR Dist Indicator × Post			0.058***	0.026
			(3.05)	(1.13)
Ln Enrollment	0.005	0.004	0.011	0.003
	(0.51)	(0.41)	(1.02)	(0.38)
Observations	1,854	948	1,854	948
R-squared	0.236	0.219	0.218	0.220
Insurer × Market × State FE	Y	Y	Y	Y
Year FE	N	N	Y	Y
Market × Year FE	Y	Y	N	N

Appendix A: Variable Definitions

Name	Definition	Source
Dependent Variables		
ΔCosts	The change in the natural logarithm of average costs, defined as total reimbursements divided by the number of enrollees, for insurer i in state s and market segment m between year $t-1$ and year t.	CMS
ΔAffiliated Transactions	The change in the natural logarithm of average transactions with affiliated entities, defined as total affiliated transactions divided by the number of enrollees, for insurer i between year $t-1$ and year t.	NAIC Exhibit 7 Part 1
ΔUnaffiliated Transactions	The change in the natural logarithm of average transactions with unaffiliated entities, defined as total unaffiliated transactions divided by the number of enrollees, for insurer i between year $t-1$ and year t.	NAIC Exhibit 7 Part 1
ΔQuantity	The change in the natural logarithm of average quantity (weighted outpatient visits, weighted by hospital total expense) for insurer i in state s and market segment m between year $t-1$ and year t.	AHA Annual Survey
ΔPlacebo Quantity	The change in the natural logarithm of average placebo quantity (weighted outpatient visits, weighted by hospital total expense) in the same state and same year for insurer i in state s and market segment m between year $t-1$ and year t.	AHA Annual Survey
Deal Indicator	An indicator equal to 1 if insurer i, or the insurer's parent entity, engages in at least one vertical integration deal as the acquirer in year t, and 0 otherwise.	LSEG SDC Platinum
Independent Variables		
MLR Dist	The distance of the average medical loss ratio (MLR) from the regulatory threshold in the five-year period prior to regulation implementation for insurer i in state s and market segment m in year t if the MLR is below the threshold, and 0 otherwise.	NAIC Insurance Utilization
MLR Dist Indicator	An indicator equal to 1 if the average distance of the medical loss ratio (MLR) from the regulatory threshold in the five-year period prior to regulation implementation for insurer i in state s and market segment m in year t is below the threshold, and 0 otherwise.	NAIC Insurance Utilization
Post	An indicator equal to 1 if year is 2011 and after, and 0 otherwise.	CMS
VI	An indicator equal to 1 if insurer i has vertical integration deals in the pre-period, and 0 otherwise.	LSEG SDC Platinum
Ln Enrollment	The natural logarithm of enrollment for insurer i in state s and market segment m in year t.	NAIC Insurance Utilization
MLR Dist (Insurer)	The weighted average of $MLR\ Dist$ for insurer i in year t, weighted by number of enrollees in each market and state. $MLR\ Dist$ is the distance of the average medical loss ratio (MLR) from the regulatory threshold in the five-year period prior to regulation implementation for insurer i in state s and market segment m in year t if the MLR is below the threshold, and 0 otherwise.	NAIC Insurance Utilization

Appendix B. Theoretical Framework

Model Setup: Market and Participants

We model a market with three agents: a representative Consumer (C), an Insurer (I), and a Healthcare Provider (P). We analyze the case where the Insurer and Provider are vertically integrated, forming a single consolidated firm.

Notation and Variables

Key variables are defined as follows:

- p: The insurance premium charged to the consumer.
- $n(p)$: Demand for insurance (number of enrollees), a function of p.
- c: The unit reimbursement rate paid by I to P. This is an internal transfer price.
- k: The marginal cost to P of delivering one unit of healthcare ($k < c$).
- θ: The consumer's coinsurance rate, $0 < \theta < 1$.
- p_c: The out-of-pocket price of care for the consumer, defined as $p_c = \theta c$.
- $q(p_c)$: The quantity of medical services consumed (medical adherence), a function of p_c.
- $\underline{M}$: The regulatory minimum Medical Loss Ratio (MLR), $0 < \underline{M} < 1$.

Demand and Profit Functions

The consolidated firm's total profit (π_{Total}) is the sum of insurer profit and provider profit.

$$\pi_I = n(p)[p - (1-\theta)c \cdot q(\theta c)]$$

$$\pi_P = n(p) \cdot q(\theta c)[c - k]$$

The consolidated profit, $\pi_{Total} = \pi_I + \pi_P$, simplifies to:

$$\pi_{Total} = n(p)[p - q(\theta c)(k - \theta c)]$$

This function shows that the internal transfer price c only affects total profit through its impact on the consumer's out-of-pocket price ($p_c = \theta c$) and thus their demand for care $q(p_c)$.

Assumptions

We base the model on two key assumptions regarding market elasticities, reflecting informational frictions and the nature of healthcare.

Assumption 1 (Inelastic Demand for Insurance)**.** *Consumer demand for insurance plans is relatively inelastic due to search frictions and the mandate.*

$$\epsilon_{ins} = \left| \frac{\partial n}{\partial p} \frac{p}{n} \right| < 1$$

This implies that lowering the premium p will decrease total premium revenue ($n \cdot p$).

Assumption 2 (Inelastic Demand for Medical Care)**.** *Consumer demand for medical care is relatively inelastic, but not perfectly so. An increase in out-of-pocket price reduces adherence.*

$$\epsilon_{med} = \left| \frac{\partial q}{\partial p_c} \frac{p_c}{q} \right| < 1 \quad \textit{and} \quad \frac{\partial q}{\partial p_c} < 0$$

The Regulatory Constraint

The MLR regulation imposes a floor on the insurer's cost ratio.

Definition 1 (MLR Compliance)**.** *An insurer is compliant if their MLR meets or exceeds the minimum $\underline{M}$.*

$$MLR = \frac{Claims}{Premiums} = \frac{(1-\theta)c \cdot q(\theta c)}{p} \geq \underline{M}$$

We analyze a noncompliant insurer whose current state $MLR_0 < \underline{M}$. This firm must choose a strategy to close the gap. Let R_{req} be the required per-enrollee increase in claims or equivalent rebate:

$$R_{req} \approx p \cdot \underline{M} - (1-\theta)c \cdot q$$

Analysis of Compliance Strategies

The noncompliant firm evaluates three options to maximize post-regulation profit.

Option (i): Issue Rebates

The firm maintains operations (p, c, q) and issues a cash rebate of R_{req} to consumers. The profit is the original consolidated profit minus the rebate outflow.

$$\pi_{(i)} = n(p)[p - q(\theta c)(k - \theta c)] - n(p) \cdot R_{req}$$

The rebate R_{req} is a loss to the firm.

Option (ii): Decrease Premiums

The firm lowers the premium from p to p_{new} such that $MLR = \underline{M}$.

$$p_{new} = \frac{(1-\theta)c \cdot q(\theta c)}{\underline{M}}$$

The new profit is:

$$\pi_{(ii)} = n(p_{new})[p_{new} - q(\theta c)(k - \theta c)]$$

Option (iii): Inflate Reimbursement Costs

The firm raises the internal transfer price from c to c' to meet the MLR.

$$\frac{(1-\theta)c' \cdot q(\theta c')}{p} = \underline{M}$$

Because this is an internal transfer, the "cost" is not a loss. The new consolidated profit is:

$$\pi_{(iii)} = n(p)[p - q(\theta c')(k - \theta c')]$$

Propositions and Predictions

We now compare the profitability of these options based on our assumptions.

Proposition 1 (Cost Inflation vs. Rebates)**.** *Given vertical integration, inflating internal costs is more profitable than issuing rebates.*

$$\pi_{(iii)} > \pi_{(i)}$$

Proof. Let $q_0 := q(\theta c)$ and $MLR_0 = \frac{(1-\theta)cq_0}{p} < \underline{M}$. Define the required per-enrollee top-up

$$R_{req} := p\underline{M} - (1-\theta)cq_0 > 0.$$

Under option (iii), choose $c' > c$ such that MLR binds:

$$(1-\theta)c'q(\theta c') = p\underline{M}.$$

Let $q_1 := q(\theta c')$. Since $c' > c$ and $q'(\cdot) < 0$ (Assumption 2), we have $q_1 < q_0$.

Profits under (i) and (iii) are

$$\pi_{(i)} = n(p)\Big[p - q_0(k - \theta c)\Big] - n(p)R_{req}, \qquad \pi_{(iii)} = n(p)\Big[p - q_1(k - \theta c')\Big].$$

Hence

$$\pi_{(iii)} - \pi_{(i)} = n(p)\Big(- q_1(k - \theta c') + q_0(k - \theta c) + R_{req}\Big).$$

Using the binding constraints $(1-\theta)c'q_1 = p\underline{M}$ and $(1-\theta)cq_0 = p\,MLR_0$, we can rewrite

$$R_{req} = p\underline{M} - (1-\theta)cq_0 = (1-\theta)(c'q_1 - cq_0).$$

Substituting and collecting terms yields

$$\pi_{(iii)} - \pi_{(i)} = n(p)\Big(k(q_0 - q_1) + (c'q_1 - cq_0)\Big).$$

The first term is strictly positive because $q_0 > q_1$ and $k > 0$. The second term is strictly positive because

$$c'q_1 - cq_0 = \frac{R_{req}}{1-\theta} > 0.$$

Therefore $\pi_{(iii)} - \pi_{(i)} > 0$, proving $\pi_{(iii)} > \pi_{(i)}$. □

Proposition 2 (Cost Inflation vs. Premium Cuts)**.** *Given inelastic demand for insurance, inflating internal costs is more profitable than decreasing premiums.*

$$\pi_{(iii)} > \pi_{(ii)}$$

Proof. Option (ii) reduces the premium to p_{new} so that MLR binds holding (c, q_0) fixed:

$$p_{new} = \frac{(1-\theta)cq_0}{\underline{M}}.$$

Since $MLR_0 < \underline{M}$, it follows that $p_{new} < p$.

Option (iii) keeps premium p and chooses c' so that MLR binds:

$$(1-\theta)c'q(\theta c') = p\underline{M}.$$

Let $q_1 := q(\theta c')$. By Assumption 2, $c' > c$ implies $q_1 < q_0$.

Using $\pi = n(\cdot)\big[p - kq(\cdot) + \theta c\, q(\cdot)\big]$ and imposing the binding MLR constraints,

$$(1-\theta)cq_0 = \underline{M}\, p_{new} \quad \text{and} \quad (1-\theta)c'q_1 = \underline{M}\, p,$$

we obtain

$$\pi_{(ii)} = n(p_{new})\Big[Ap_{new} - kq_0\Big], \qquad \pi_{(iii)} = n(p)\Big[Ap - kq_1\Big],$$

where $A := 1 + \frac{\theta \underline{M}}{1-\theta} > 1$. Therefore

$$\pi_{(iii)} - \pi_{(ii)} = A\Big(n(p)p - n(p_{new})p_{new}\Big) + k\Big(n(p_{new})q_0 - n(p)q_1\Big).$$

We show both brackets are strictly positive. First, by Assumption 1 and the standard downward-sloping property $n'(p) < 0$, inelastic demand implies $p \mapsto p\,n(p)$ is strictly increasing; thus $p_{new} < p$ implies

$$n(p)p > n(p_{new})p_{new}.$$

Second, $p_{new} < p$ implies $n(p_{new}) > n(p)$, and $q_0 > q_1$ as shown above, hence

$$n(p_{new})q_0 > n(p)q_1.$$

Since $A > 0$ and $k > 0$, both components in $\pi_{(iii)} - \pi_{(ii)}$ are strictly positive, so $\pi_{(iii)} > \pi_{(ii)}$. □

Derivation of Hypotheses

Propositions 1 and 2 demonstrate that $\pi_{(iii)}$ is the dominant strategy for a noncompliant, vertically integrated firm. This leads directly to our two testable hypotheses.

Hypothesis 1. *After the ACA regulation, insurance companies with an MLR below the regulatory threshold are more likely to raise costs through transactions with vertically integrated entities, compared to those with an MLR above the threshold.*

Proof. This follows from our propositions. Noncompliant firms (MLR $< \underline{M}$) must act and will choose the profit-maximizing strategy, $\pi_{(iii)}$. Compliant firms (MLR $> \underline{M}$) face no such constraint and have no regulatory incentive to artificially inflate c. □

Hypothesis 2. *After the ACA regulation, patients covered by noncompliant insurance companies (who choose strategy (iii)) experience higher coinsurance payments, which in turn leads to a decrease in their medical adherence.*

Proof. Strategy (iii) is defined by the action $c \to c'$, where $c' > c$.

- **Higher Coinsurance:** The patient's out-of-pocket price is $p_c = \theta c$. This mechanically increases to $p_c' = \theta c'$.
- **Decreased Adherence:** Per Assumption 2, $\frac{\partial q}{\partial p_c} < 0$. As p_c rises, the quantity of care q (medical adherence) necessarily falls.

□

Online Appendix

Regulating Profitability

- Timeline of Public Debate Surrounding the ACA OA.A
- Vertical Integration and Response from Regulators OA.B
- Distribution of Medical Loss Ratio OA.C
- Examples of Vertical Integration Deals OA.D
- Difference-in-Differences Analysis of Premium Change OA.E
- Market Concentration and Change in Costs OA.F
- Robustness Checks with More Fixed Effects and Sample Restrictions OA.G.

OA.A. Timeline of Public Debate Surrounding the ACA

Public discussion surrounding the Affordable Care Act (ACA) evolved substantially between mid-2009 and its enactment on March 23, 2010. Early debate centered on broad structural reform, including the creation of a public insurance option[28], employer and individual mandates, insurance exchanges, and insurance market regulations. Public opinion during this period was sharply divided. National polling in March 2010 indicated that Americans were split or modestly negative on the legislation overall, even while expressing support for individual provisions such as prohibiting denials for pre-existing conditions.[29] News coverage in February to March 2010 emphasized legislative strategy rather than fundamental redesign of the bill, suggesting that the structure of reform was largely set by late 2009.

The Medical Loss Ratio (MLR) provision evolved substantially since the first bill. Early reform proposals in July 2009, including the House bill *America's Affordable Health Choices Act of 2009* (H.R. 3200) and the Senate HELP Committee bill *Affordable Health Choices Act* (S. 1679), introduced the concept of minimum loss ratios and consumer rebates but left the specific thresholds to be determined by the Secretary of Health and Human Services. The structure changed during the Senate Finance Committee negotiations in September 2009 (the Baucus "Chairman's Mark"), where lawmakers codified explicit minimum standards of 80% for the individual and small-group markets and 85% for the large-group market while broadening the numerator to include spending on "activities that improve health care quality" in addition to reimbursement for clinical services.[30] This framework was incorporated into the version of H.R. 3590 passed by the Senate on December 24, 2009 and ultimately enacted as Section 1001 of the Patient Protection and Affordable Care Act, which added Section 2718 to the Public Health Service Act (codified at 42 U.S.C. § 300gg–18).[31] Subsequent implementation through the 2010 HHS Interim Final Rule (45 C.F.R. Part 158) clarified the formula and narrowly defined quality improvement activities (QIA), allowing care coordination, disease management, and patient safety initiatives while excluding most administrative functions in order to prevent insurers from inflating the MLR numerator.

Responses from different stakeholders in healthcare sector were heterogeneous but broadly pragmatic and supportive: hospitals and physicians prioritized coverage expansion despite concerns for capacity constraints; insurers focused on margin constraints and imple-

[28] The public option was a proposed government-run health insurance plan that would have been offered alongside private insurance plans, primarily within the ACA's new health insurance marketplaces

[29] Kaiser Family Foundation, "Kaiser Health Tracking Poll: March 2010," March 2010.

[30] U.S. Senate Committee on Finance, *America's Healthy Future Act of 2009*, Chairman's Mark, September 2009.

[31] *Patient Protection and Affordable Care Act*, Pub. L. No. 111-148, §1001 (2010), amending the Public Health Service Act by adding §2718.

mentation design, compromising for tighter regulation but benefiting from broader insurance coverage.

Health insurers faced the most direct regulatory restructuring under the ACA. Early in 2009, insurers strongly opposed proposals for a public insurance option, which was perceived as a direct competitive threat. By December 2009, as the Senate bill eliminated the public option, insurer focus shifted toward regulatory provisions such as MLR thresholds, rate review authority, and guaranteed issue requirements. Insurers publicly argued that strict MLR rules could destabilize markets, particularly in the individual segment. Insurers conditionally supported guaranteed issue provisions provided that a strong individual mandate accompanied them to mitigate adverse selection. By early March 2010, insurers were no longer attempting to block passage outright; rather, lobbying efforts concentrated on implementation details, including the classification of quality improvement expenses under MLR calculations.

Immediately following enactment, public opinion remained divided. Surveys conducted shortly after passage indicated persistent skepticism about the law's cost implications and government role. Health insurers publicly committed to compliance while continuing to raise concerns about implementation details. America's Health Insurance Plans (AHIP) contended that the MLR thresholds risked producing unintended effects, including potential disruption of coverage in the individual market and less competition.

OA.B. Vertical Integration and Response from Regulators

OA.B.1. Filing For M&A Approval

Under the Hart–Scott–Rodino (HSR) Act, parties to a merger or acquisition must file a pre-merger notification with the Federal Trade Commission (FTC) and the Department of Justice (DOJ) if the value of the transaction meets the statutory minimum threshold. As of 2010, filing was automatically required if the deal size exceeded $253.7 million.[32] Upon filing, a statutory 30-day waiting period begins, during which either the FTC or DOJ—through an internal clearance process[33]—assumes responsibility for reviewing the transaction. The reviewing agency evaluates whether the merger may substantially lessen competition under Section 7 of the Clayton Act. If competitive concerns arise, the agency may issue a Second Request for additional information, negotiate structural remedies such as divestitures, or seek to block the transaction in federal court. In healthcare transactions, the Centers for Medicare & Medicaid Services (CMS) does not conduct antitrust review but may play a parallel regulatory role when Medicare Advantage, Medicare Part D, Medicaid managed care, or Affordable Care Act exchange contracts are involved; CMS may approve contract transfers or ensure compliance with program rules, but it does not determine competitive legality under federal antitrust law.

OA.B.2. DOJ's response to vertical integration deals

The Department of Justice (DOJ)'s review of the Cigna–Express Scripts and CVS–Aetna transactions reflects a generally permissive stance toward vertical integration. Across both decisions, the DOJ emphasized that increased market concentration from horizontal mergers could harm consumers. However, it expressed confidence that vertical integration could generate efficiencies, enhance coordination, and potentially benefit patients without necessarily threatening competition.

[32] Under the HSR Act, reportability is determined primarily by the *size-of-transaction* and, in certain cases, the *size-of-person* tests. The size-of-transaction test measures the total value of voting securities, assets, or non-corporate interests that will be held as a result of the acquisition. In 2010, all deals with transaction value exceeding $253.7 million must be filed for approval. For transactions valued between $63.4 million and $253.7 million, the size-of-person test required that one party have at least $126.9 million in total assets or annual net sales and the other have at least $12.7 million. These figures were adjusted annually for inflation and published by the FTC pursuant to 15 U.S.C. §18a(a)(2).

[33] The agencies determine which one will conduct the investigation based on industry expertise, prior enforcement experience, and resource considerations. For example, the DOJ has historically reviewed airline and telecommunications mergers, while the FTC has frequently handled pharmaceutical and hospital mergers. In healthcare insurance markets, DOJ has often obtained clearance for insurer mergers such as Cigna–Express Scripts and CVS–Aetna. Only one agency ultimately reviews the transaction, avoiding duplicative investigations and ensuring a single enforcement decision under Section 7 of the Clayton Act.

Cigna-Express Script deal: After a six-month investigation[34], the DOJ evaluated whether the combined firm would have the ability and incentive to foreclose rival health insurers from access to competitively priced pharmacy benefit management (PBM) services or otherwise raise their costs. The Division determined that such foreclosure was unlikely because Cigna's share of the national health insurance market was relatively limited, Express Scripts would continue to face competition from at least two other large PBMs and several smaller firms, and rival insurers could turn to alternative PBM providers if the merged entity attempted to raise prices. The Department further reasoned that any attempt to disadvantage competing insurers would likely result in lost PBM business rather than offsetting gains in downstream insurance markets. Accordingly, the DOJ concluded that the transaction was unlikely to harm competition in either the PBM services market or downstream health insurance markets and therefore declined to challenge the merger.

CVS-Aetna deal: Following its review of CVS Health Corporation's proposed acquisition of Aetna Inc., the DOJ concluded that the vertical transaction raised competitive concerns in the Medicare Part D prescription drug plan market and therefore required a divestiture of Aetna's subsidiary WellCare Health Plans as a condition of approval.[35] The Department alleged that CVS's subsidiary, SilverScript, and Aetna were direct competitors in the sale of individual Medicare Part D plans in numerous geographic regions across the United States, and that the merger would substantially lessen competition in those markets absent divestiture. DOJ further asserted that entry or expansion by other insurers would not be timely, likely, or sufficient to offset the competitive harm[36]. To remedy this horizontal overlap, the DOJ required Aetna to divest its entire standalone Medicare Part D prescription drug plan business to WellCare Health Plans, Inc., an existing Medicare-focused insurer, thereby preserving competition for beneficiaries. The Department concluded that "the divestitures required here allow for the creation of an integrated pharmacy and health benefits company that has the potential to generate benefits by improving the quality and lowering the costs of the healthcare services that American consumers can obtain.".

[34]U.S. Department of Justice, Antitrust Division, "Closing Statement of Assistant Attorney General Makan Delrahim Regarding the Cigna–Express Scripts Merger," September 17, 2018, https://www.justice.gov/atr/closing-statement.

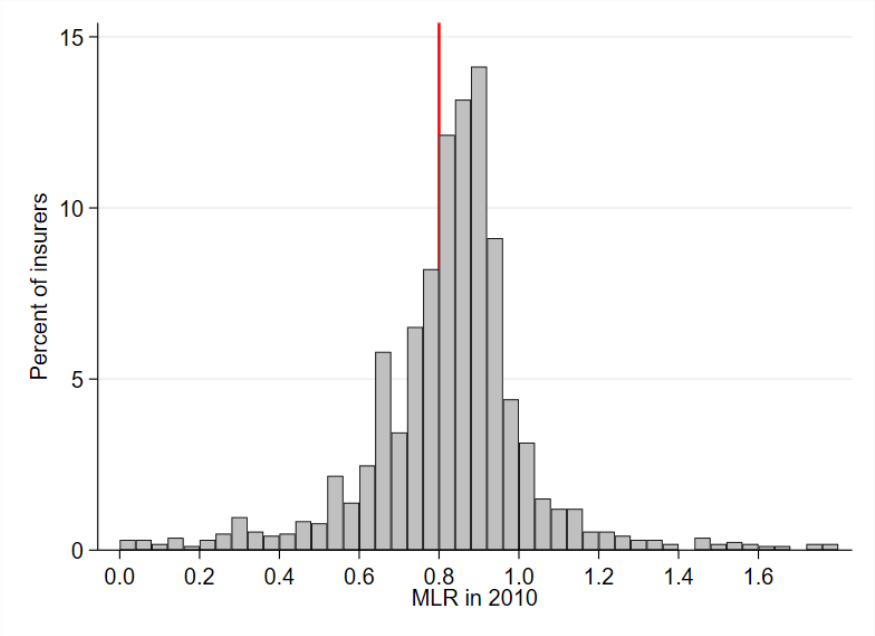
[35]U.S. Department of Justice, Office of Public Affairs, Justice Department Requires CVS and Aetna to Divest Aetna's Medicare Individual Part D Prescription Drug Plan Business, October 10, 2018, https://www.justice.gov/archives/opa/pr/justice-department-requires-cvs-and-aetna-divest-aetna-s-medicare-individual-part-d.

[36]Complaint, *United States and Plaintiff States v. CVS Health Corp. and Aetna Inc.*, No. 1:18-cv-02340 (D.D.C. Oct. 10, 2018), U.S. Department of Justice, Antitrust Division, available at https://www.justice.gov/atr/case-document/file/1100091/dl?inline.

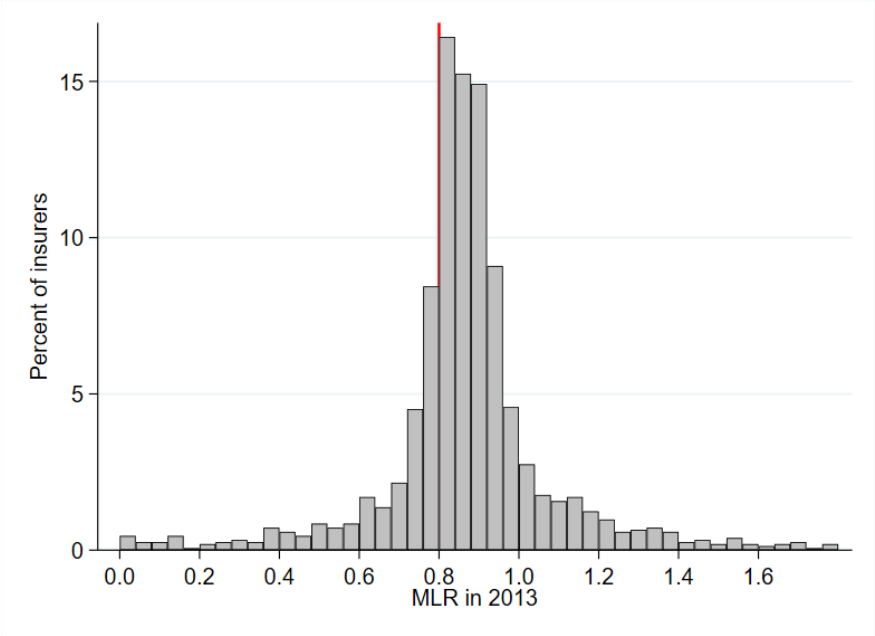
OA.C. Distribution of Medical Loss Ratio

The figure in Panel A presents histograms of the medical loss ratio (MLR) in 2010. The figure in Panel B presents histograms of the MLR in 2013. The red vertical line marks MLR = 0.8. Both Panel C and D presents the Cattaneo, Jansson & Ma (2018) test results. Panel C presents histograms and test result of the MLR defined as claims/premiums of individual market in 2013. Panel D presents histograms and test result of the reported preliminary MLR after adjustment of individual market in 2013.

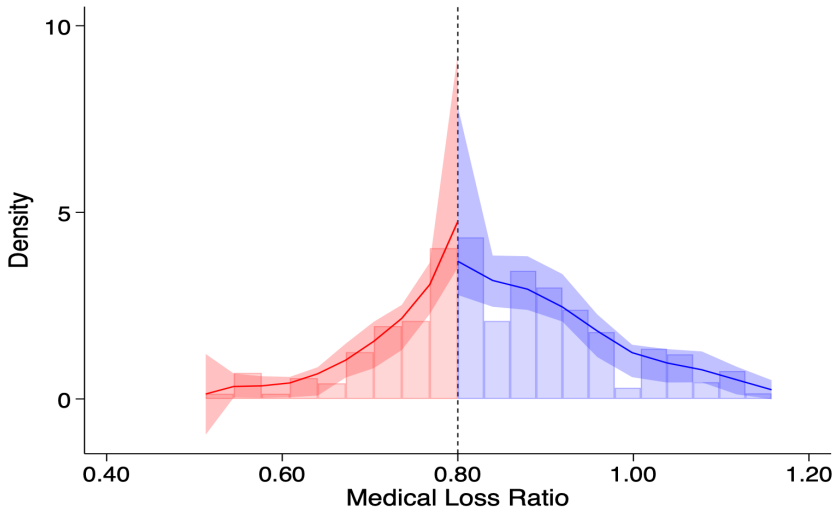
Panel A. Histogram of MLR in 2010



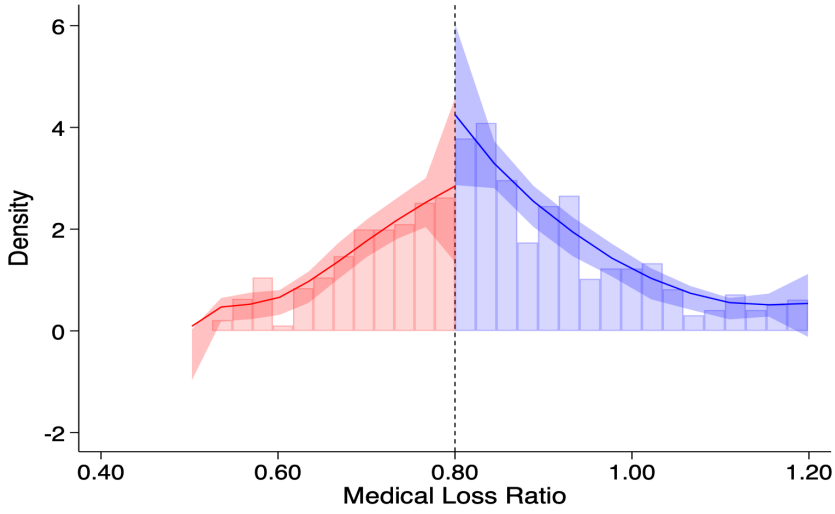
Panel B. Histogram of MLR in 2013



Panel C. Histogram of MLR (claims/premium) in 2013



Panel D. Histogram of MLR after adjustment in 2013



OA.D. Examples of Vertical Integration Deals

Panel A presents selected vertical integration deals. It reports the names of the target and acquirer, the year of deal completion, and the stated strategic rationale of the transaction in their annual report 10-K filings. The strategic motivations underlying vertical integration have evolved over time from market penetration toward cost integration.
Panel B presents six examples of vertical integration deals sorted by deal values. It reports the names of target, acquirer, complete date of the deal, target details and the deal value ($ million).

Panel A: Deals and Stated Strategic Motives

Target	Acquirer	Year	Stated Rationale
Active Health Mng.	Aetna	2005	Enhance health analytics and care management capabilities
HMS Healthcare	Aetna	2005	Expand regional provider network footprint
Aetna BH	Aetna	2005	Integrate behavioral health services
Broadspire Disability	Aetna	2006	Expand disability and leave management services
Horizon Behav. Svcs.	Aetna	2009	Strengthen employee assistance programs
Wellness Inc.	OptumHealth (UHG)	2010	Integrate biometric screening and real-time health data into wellness platform
Medicity	Aetna	2011	Support provider connectivity, ACO participation, and consumer engagement
Prodigy Health Group	Aetna	2011	Expand third-party administration for self-funded employers
PayFlex	Aetna	2011	Expand account-based health plan administration
Coventry Health Care	Aetna	2013	Broaden geographic reach and product scope
Express Scripts	Cigna	2018	Integrate medical, pharmacy, and behavioral care to enhance affordability, cost predictability, and earnings growth

Panel B: Six Deals Sorted by Deal Value

Target	Acquirer	Date	Target Details	Deal Value ($ M)
Griffin Imaging LLC	Tenet Healthcare Corp	2011-01-04	Diagnostic Imaging	3.82
Conroe Surgery Center 2 Ltd	Tenet Healthcare Corp	2011-10-14	Surgery	4.19
Specialty Therapeutic Hldg Inc	Centene Corp	2013-04-01	7 Pharmacies	152
Senior Whole Health	Magellan Healthcare Inc	2017-10-31	Senior Care	400
Vanguard Health Systems Inc	Tenet Healthcare Corp	2013-10-01	Hospitals	4231.19
Express Scripts Holding Co	Cigna Corp	2018-12-20	PBM	69770.18

OA.E. Difference-in-Differences Analysis of Premium Change

This table presents results from the difference-in-differences model regressing average premium change on the treatment variable $MLR\ Dist$ interacted with the $Post$ indicator, and from a triple-differences model where $MLR\ Dist \times Post$ is interacted with the binary variable VI. The unit of observation is insurer–state–market–year. In Panel A [Panel B], Columns (1) and (2) [Columns (1) and (4), and Columns (2) and (5) of Panel B] report the difference-in-differences estimates using insurers with and without vertical integration deals in the pre-regulation period. Column (3) [Columns (3) and (6) of Panel B] reports the triple-differences estimates using the full sample. The dependent variable in Panel A [Panel B] is $\Delta Premiums$, defined as the change in the natural logarithm of average premiums (total premiums divided by the number of enrollees) for insurer i in state s and market segment m between year $t-1$ and year t. The key independent variables are $MLR\ Dist \times Post$ and $MLR\ Dist \times Post \times VI$. $MLR\ Dist$ is defined as the distance of the insurer's average medical loss ratio (MLR) from the regulatory threshold in the pre-regulation period if the MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. VI is an indicator equal to 1 if insurer i have pre-existing vertical integration structure, and 0 otherwise. In Panel B, Columns (1)–(3) present results for the individual market segment, and Columns (4)–(6) present results for the group market segment. All regressions include insurer group fixed effects, market × state fixed effects, and state × year fixed effects. t-statistics, reported in parentheses, are based on standard errors clustered at the insurer level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed). See Appendix A for variable definitions.

Panel A. **Premium Change and Vertical Integration**

Dependent Variable	Δ Premiums		
	Pre-period VI	Pre-period non-VI	All Insurers
	(1)	(2)	(3)
MLR Dist × Post × VI			-0.072
			(-0.40)
MLR Dist × Post	-0.019	0.092	0.063
	(-0.26)	(0.58)	(0.40)
Post × VI			-0.002
			(-0.20)
Ln Enrollment	-0.006	-0.011*	-0.007
	(-0.68)	(-1.77)	(-1.11)
Observations	1,849	951	2,800
R-squared	0.233	0.284	0.240
Insurer × Market × State FE	Y	Y	Y
Year FE	Y	Y	Y

Panel B. **Premium Change and Vertical Integration by Market Segments**

Dependent Variable	Δ Premiums (Individual Market)			Δ Premiums (Group Market)		
	Pre-period VI	Pre-period non-VI	All Insurers	Pre-period VI	Pre-period non-VI	All Insurers
	(1)	(2)	(3)	(4)	(5)	(6)
MLR Dist × Post × VI			0.002			0.041
			(0.01)			(0.20)
MLR Dist × Post	0.063	0.300	0.150	-0.045	-0.100	-0.085
	(0.34)	(1.09)	(0.60)	(-0.74)	(-0.53)	(-0.45)
Post × VI			0.014			-0.005
			(0.56)			(-0.48)
Ln Enrollment	-0.001	-0.046**	-0.016	-0.009	-0.004	-0.007
	(-0.05)	(-2.55)	(-1.20)	(-0.98)	(-0.61)	(-1.08)
Observations	335	274	609	1,514	677	2,191
R-squared	0.263	0.223	0.237	0.229	0.344	0.246
Insurer × Market × State FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y

OA.F. Market Concentration and Change in Costs

This table presents results from the triple difference-in-differences model regressing average enrollment changes on the binary treatment variable *MLR Dist* interacted with the *Post* indicator and *High Market Concentration* indicator. The unit of observation is insurer–state–market–year. In Columns (1), the sample is insurers with pre-period vertical integration deals. In Columns (2), the sample is insurers with no pre-period vertical integration deals. In Columns (1) and (2), the dependent variable is Δ *Costs*, defined as the change in the natural logarithm of average costs for insurer i in state s and market segment m between year $t-1$ and year t. *MLR Dist* is defined as the distance of the insurer's average medical loss ratio (MLR) from the regulatory threshold in the pre-regulation period if the MLR is below the threshold, and 0 otherwise, for each insurer i in state s and market segment m. *High Market Concentration* is an indicator equal to 1 if reimbursement concentration is in the highest quintile across the sample, and 0 otherwise. We measure reimbursement concentration by computing each insurer's reimbursements as a share of total reimbursements within the same state and market segment, and then, for each state–market-segment pair in the pre-regulation year, calculating the sum of squared market shares. All regressions include insurer × market × state fixed effects and year fixed effects. t-statistics, reported in parentheses, are based on standard errors clustered at the insurer level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed).

Dependent Variable	Δ Costs	
	Pre-period VI	Pre-period Non-VI
	(1)	(2)
MLR Dist × Post × High Market Concentration	1.336***	0.052
	(3.39)	(0.11)
MLR Dist × Post	0.669***	0.143
	(4.50)	(0.55)
Post × High Market Concentration	-0.052	0.026
	(-1.09)	(0.89)
Ln Enrollment	0.004	0.003
	(0.35)	(0.33)
Observations	1,770	922
R-squared	0.229	0.213
Insurer × Market × State FE	Y	Y
Year FE	Y	Y

OA.G. Robustness Checks with More Fixed Effects and Sample Restrictions

This table presents results from the difference-in-differences model regressing cost change on the continuous treatment variable interacted with the *Post* indicator. The unit of observation is insurer–state–market–year for those that are vertically integrated in the pre-period. The dependent variable is $\Delta Costs$, defined as the change in the natural logarithm of average costs (total reimbursements divided by the number of enrollees) for insurer i in state s and market segment m between year $t-1$ and year t. Columns (1) includes insurer × market × state fixed effects and year fixed effects. This is the same as the one in Table3. Column (2) to (4) all include year fixed effects, and insurer fixed effects, insurer and market fixed effects, insurer, market and state fixed effects respectively. Columns (5) and (6) have the same fixed effect structures as in Column (1) but Column (5) uses the sample without 2008-2009 being removed, and Column (6) uses the sample without nonprofit insurers being excluded. t-statistics, reported in parentheses, are based on standard errors clustered at the insurer level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively (two-tailed). See Appendix A for variable definitions.

Dependent Variable	ΔCosts					
	(1)	(2)	(3)	(4)	(5)	(6)
MLR Dist × Post	0.883***	0.801***	0.802***	0.817***	0.828***	0.771***
	(7.599)	(7.088)	(7.065)	(7.279)	(4.447)	(5.928)
Ln Enrollment	0.00511	0.000345	-0.000107	0.00237	0.00525	0.00741
	(0.510)	(0.0907)	(-0.0251)	(0.484)	(0.647)	(0.900)
MLR Dist		-0.398***	-0.394***	-0.376***		
		(-3.423)	(-3.436)	(-2.910)		
Observations	1,854	1,868	1,868	1,866	2,443	2,661
R-squared	0.236	0.131	0.131	0.148	0.166	0.206
Insurer × Market × State FE	Y	N	N	N	Y	Y
Insurer FE	N	Y	Y	Y	N	N
Market FE	N	N	Y	Y	N	N
State FE	N	N	N	Y	N	N
Year FE	Y	Y	Y	Y	Y	Y
2008–2009 removed	Y	Y	Y	Y	N	Y
Nonprofit insurers excluded	Y	Y	Y	Y	Y	N