



Price Transparency's Impact on Hospital Prices: An Analysis of the 2021 Hospital Transparency Final Rule

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Health care expenditures in the United States have risen steadily for decades, imposing a growing financial burden on patients. In response, President Trump signed an executive order in 2019 requiring hospitals to publicly post the prices of 300 common procedures on their websites that was implemented in 2021. Prior research suggests that price transparency can either increase or decrease prices. This study employs ordinary least squares (OLS) and a difference-in-difference (DiD) framework to evaluate whether the executive order reduced service prices between 2018 and 2022. I hypothesize that prices decline in highly competitive hospital markets but rise in less competitive markets following the transparency mandate. Results indicate no statistically significant change in prices across varying levels of market competition as hospitals became more transparent. The results may be attributed to low

Introduction

Health expenditures in the United States have been rising steadily for decades, placing a financial burden on patients and contributing to medical debt (American Medical Association, 2025). In response, President Trump signed an executive order in 2019, effective in 2021, requiring hospitals to publicly disclose prices for common services. This federal hospital price transparency policy was intended to help patients make informed choices and lower hospital prices nationwide.

In this paper, I examine the effect of the hospital price transparency (HPT) executive order on hospital prices. Prior literature finds mixed effects of price transparency, with prices decreasing in some settings and increasing in others. These differing outcomes may reflect differences in regional hospital market competition across the United States. I test the hypothesis that the impact of price transparency varies by market concentration: hospitals operating in highly competitive markets may respond to transparency by lowering prices, while hospitals in less competitive markets may increase prices. To evaluate this hypothesis, I employ both ordinary least squares and difference-in-differences models to estimate how increases in price transparency affect hospital markups and to assess how prior state-level transparency laws influenced markups relative to states without such laws.

While previous research has primarily focused on the effects of state-level price transparency, no

studies have examined its impact nationally, despite the policy impacting hospitals nationally. By using cross-sectional and panel data from 2018–2022, this study provides a national assessment of the policy's effect on hospital pricing. I begin by reviewing the policy details, the theoretical framework of hospital pricing and price transparency, and the existing literature. I describe the data sources and empirical models, present the results, and discuss the findings, which indicate that hospital price transparency did not significantly alter markups during this period. These findings shed light on the limitations of transparency policies as a tool for controlling healthcare costs and highlight the decision making that hospitals face in response to public pricing information.

Background

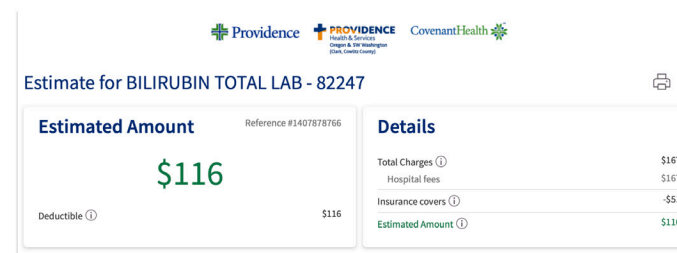
Details of the Policy

Healthcare expenditures in the United States have risen steadily for decades (Adjei et al., 2024). A contributor to this increase is rising service prices, the overall payment that the hospital charges patients and insurers. Between 2015 and 2019, health spending increased by 21.8%, with about two-thirds of the increase attributable to higher service prices (2019 HEALTH CARE COST and UTILIZATION REPORT, 2021).

To address rising medical expenditures, President Trump signed Executive Order 13877, "Improving Price and Quality Transparency in American Healthcare to Put Patients First", in 2019. The executive order required hospitals to make clear,



accessible pricing information publicly available through a machine-readable file and a consumer-friendly display covering at least 300 shoppable services. The idea of price transparency in healthcare is not new. Before 2019, 27 states had price transparency laws; the laws ranged from requiring a good-faith estimate upon request to requiring hospitals to disclose the out-of-pocket price to uninsured patients. The 2019 executive order created a federal blanket price transparency policy that was more expansive, mandating hospitals to publicize prices for both uninsured and insured patients. In response to the 2019 executive order, CMS Administrator Seema Verma said, “Thanks to President Trump’s vision and leadership, we are throwing open the shutters and bringing to light the price of care for American consumers. Kept secret, these prices are simply dollar amounts on a ledger; disclosed, they deliver fuel to the engines of competition among hospitals and insurers. This final rule and the proposed rule will bring the transparency we need to finally begin reducing overall healthcare costs. Today’s rules usher in a new era that upends the status quo to empower patients and put them first.” (Centers for Medicare and Medicaid Services, 2019).



Estimate for BILIRUBIN TOTAL LAB - 82247	
Estimated Amount	Reference #1407878766
\$116	
Deductible ①	\$116
Details	
Total Charges ①	\$167
Hospital fees	\$167
Insurance covers ①	-\$51
Estimated Amount ①	\$116

Figure 1: Sample price estimate a patient will see on a hospital website under the HPT

This policy would allow patients to input their health insurance status and plan information on a hospital’s website to receive an estimated price for the service they plan to receive. Figure 1 above shows a sample of the price information available to patients. In this example, a patient with an Anthem Blue Cross Blue Shield insurance plan who received a bilirubin lab, a test that accesses liver function, at Providence Hospital in Fullerton, California, would see that the total charges, or “service price,” are \$167. The service price is the overall price that the hospital charges. In

this example, the insurance provider will cover \$51 of the service price, which is an estimated “copay” or “coinsurance payment” for cost-sharing plans, leaving the patient to pay \$116 out-of-pocket. For an uninsured patient, they will only see the service price (Providence Health and Services Oregon and California, 2026).

The price transparency rule, signed in 2019, was implemented on January 1, 2021. If hospitals did not comply with this policy by the start of 2021, they would be penalized \$300/day for noncompliance. In 2022, this penalty was increased to \$10/bed/day with a minimum of \$300/day and a maximum of \$5,500/day (Koos, 2025). In his second presidency, Trump issued another executive order, Executive Order 14221, “Making America Healthy Again by Empowering Patients,” to expand the list of shoppable services reported from 300 to 500 in February 2025. In the press release following the signing of the executive order, President Trump stated, “It is the policy of the United States to put patients first and ensure they have the information they need to make well-informed healthcare decisions.” He then justified the expansion of reported services by reporting the success of the HPT rule implemented in 2021. President Trump, in the press release of the 2025 HPT executive order, says, “One economic analysis from 2023 estimated the impact of these regulations, if fully implemented, could result in as much as \$80 billion in healthcare savings for consumers, employers, and insurers by 2025. Another report from 2024 suggested healthcare price transparency could help employers reduce healthcare costs by 27 percent across 500 common healthcare services. Recent data has found that the top 25 percent of the most expensive healthcare service prices have dropped by 6.3 percent per year following the initial implementation of price transparency during my first term.” (The White House, 2025). However, the citations for the studies supporting these results were not included in the White House press release.

According to the U.S. Bureau of Labor Statistics, in 2025, “[Overall] Medical care prices rose 2.8 percent in 2024, following an increase of 0.5 percent in 2023. From December 2023 to December 2024, prices for hospital and related services rose 4.0 percent, and physicians’ services increased 2.6 percent.” The increase in healthcare spending, including physician



and clinical services, raises questions about whether the HPT lowered service prices at the current moment as President Trump stated.

Although there are penalties for noncompliance, the number of hospitals audited is low. In a 2024 report, the Office of the Inspector General estimated that 5,879 hospitals have been audited, representing about 46% (Not All Selected Hospitals Complied with the Hospital Price Transparency Rule 2024). Between 2021 and 2025, 28 hospitals were penalized for noncompliance (Hospital Price Transparency Enforcement Updates | CMS, 2026). Trump has signaled that he will increase the number of audits on hospitals, stating, “Unfortunately, progress on price transparency at the Federal level has stalled since the end of my first term. Hospitals and health plans were not adequately held to account when their price transparency data was incomplete or not even posted at all.” (The White House). A lack of enforcement may cause hospitals to be slow to become compliant, leading to prices not changing in the short run.

Hospital Pricing

Generally speaking, insurer service price is set when insurers and hospitals negotiate. These negotiations are private. Insurers use their market power to negotiate lower prices and hospitals use their market power to negotiate higher prices. Previous studies have shown that the most attractive hospitals to patients, in terms of hospital characteristics, tend to have more negotiating power relative to insurers, leading to higher prices (Wang et al., 2023 A). Other studies have shown that when there is more competition amongst insurance companies in a market, hospital prices decrease. For the uninsured, a study found that service prices for uninsured patients are less than or equal to the median negotiated rates for insured patients 47% of the time for the same general acute care hospitals in the United States. Wang et.al. attributes this finding to the fact that uninsured patients have a “lower willingness to pay and ability to pay for hospital care, and they may be more sensitive to higher hospital prices than patients with insurance coverage. Therefore, offering lower service prices might be a way that hospitals respond to the greater price sensitivity from the uninsured and underinsured

patients”. The study also suggests that prices for the uninsured are likely lower than negotiated rates in regions with stronger hospital market power and weaker insurer market power because offering lower uninsured service prices will attract price-sensitive patients who chose to forgo insurance coverage due to high costs (Wang et al. 2023 B). This finding was consistent for both private insurance and government plans such as Medicare and Medicaid, with 60% of negotiated rates being higher than the service price for the uninsured for the same service (Ruiz Sánchez, 2022). This study looked at only the service price for brain MRIs whereas Wang, Meiselbach, Cox, et al. looked at the aggregate cost-to-charge ratio reported from the CMS’s Hospital Provider Cost Report, which can explain the difference in the percentages in both of the findings.

Theory of Price Transparency

The Intuition underlying HPT is that increased transparency enables buyers to compare prices across providers and select lower priced options. In turn, suppliers are incentivized to lower prices to attract buyers (Bernstein & Crowe, 2024).

However, because patients pay for healthcare in various ways, they may not have incentives to price shop. Almost a year after the price transparency rules were released, a survey was conducted to assess people’s response to these new policies. Between December 15, 2021, and January 5, 2022, 1,539 Americans took an online survey. In the survey, the majority of respondents ranked price as the most important factor when choosing a healthcare provider, ahead of quality, convenience, and provider relationship for primary care services, knee MRIs, and newborn delivery. This would indicate that patients are sensitive to price and have incentives to price shop. However, only 24% of respondents were aware that hospitals must disclose prices for tests and treatments. When asked whether comparing prices could help them save a significant amount of money, 40% agreed; however, only 32% of respondents knew how to find prices for tests or treatments. The study also found that 40% of respondents said that they do not need to compare prices because they have insurance (Triana et al. 2022).



The reasons for unequal incentives to price shop are differences among healthcare plans. For uninsured patients, there is an incentive to price shop because they bear the full burden of the service price and will seek out hospitals with lower service prices, which is the total amount a hospital expects to be paid for a given service from the individual and/or the insurance company. Insured patients with high-deductible plans or plans with a high percentage of cost-sharing that is a function of service prices, such as the coinsurance rate, have incentives to seek hospitals with lower service prices to reduce their out-of-pocket payments. Other insured patients may have cost-sharing caps, such as copays². In that case, patients have no incentive to price shop or choose hospitals based on service prices.

Data

In this study, I use publicly available data from the Centers for Medicare and Medicaid Services (CMS), the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS), CareJourney, and the Kaiser Family Foundation to examine how price transparency affects hospital service prices.

The CMS Hospital Provider Cost Report is submitted annually by Medicare certified hospitals. Data from 2011 to 2023 are publicly available for hospitals across the United States. This dataset contains two primary types of information: (1) hospital financial data, including assets, liabilities, costs, and charges, and (2) hospital characteristics, such as the number of beds, interns, and employees. These cost reports are used for Medicare reimbursement, regulatory oversight, and hospital financial analysis. The question used to find the proportion of patients who would recommend a given hospital is in Appendix B.

Hospital reputation is a primary factor influencing patients' hospital choice. In a survey of 4,672 randomly selected adults, 61.9% of respondents reported that hospital reputation was the most important factor when choosing a hospital. Prior research supports the importance of reputation in shaping patient perceptions (Ellis et al., 2020). Mira et al. (2014) find that greater patient confidence in hospital professionals is associated with more positive perceptions of hospital safety; specifically, each additional point of confidence corresponds to

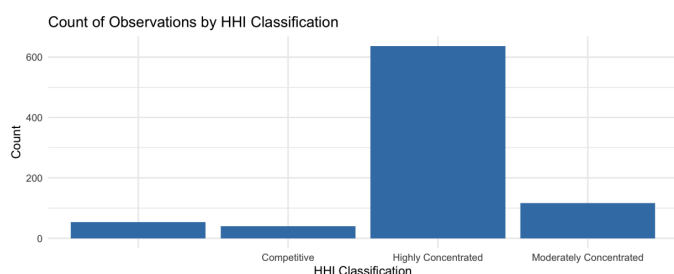
a 15% increase in perceived hospital safety. Hospital reputation also affects hospital pricing. Beauvais et al. (2020) find that hospitals with stronger reputations tend to charge slightly lower prices. To account for hospital reputation, I use HCAHPS survey data. HCAHPS is a standardized questionnaire administered to randomly selected adult patients nationwide between 48 hours and six weeks after hospital discharge. The survey includes nineteen questions related to quality of care, such as cleanliness, quietness, communication with doctors and nurses, and medication communication. These data are used both to help patients compare hospitals and to allow hospitals to monitor and improve quality. To measure hospital compliance with the HPT rule, I use data from CareJourney, published in 2022. The CareJourney dataset combines Turquoise Health's hospital transparency data with hospital-level Herfindahl-Hirschman Index (HHI) data compiled by Dr. Zack Cooper (Cooper et al., 2022). Turquoise Health's hospital transparency data provide an ordinal compliance score ranging from 1 to 5, where 5 indicates full compliance with HPT requirements and 1 indicates complete noncompliance. A score of 4 indicates that a hospital has met most HPT requirements, with largely complete pricing information and well-formatted price disclosures. A score of 3 reflects partial compliance, characterized by missing service price data or poorly formatted disclosures that limit price clarity for patients. A score of 2 indicates minimal compliance, with most pricing data missing or presented in an unclear format (Hospital Price Transparency Research Datasets | Turquoise Health, n.d.). The Turquoise Health hospital transparency dataset was initiated in March 2022. The CareJourney dataset also includes hospital-level HHI data, created by Dr. Zack Cooper in March 2022, which measures hospital market competitiveness. The HHI is calculated as the sum of the squared market shares of hospitals within a regional market. An HHI below 1,500 indicates a competitive market, an HHI between 1,500 and 2,500 indicates moderate concentration, and an HHI above 2,500 indicates a highly concentrated market. To measure insurance market concentration, I use the Large Group Insurance Market Competition dataset from the Kaiser Family Foundation, which reports the HHI scores and the market share for the largest



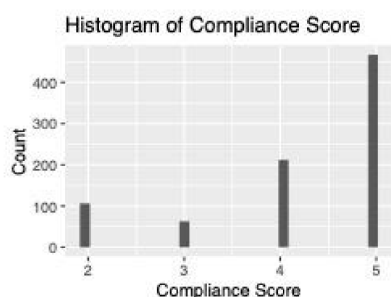
insurer in every state. The data is from 2022, aimed at capturing the market concentration of large group insurance companies for every state. An HHI score under 1,500 indicates a competitive market, 1,500 to 2,500 a moderate concentration, and above 2,500 a highly concentrated market.

Summary Statistics

Most hospitals are in the highly concentrated HHI category and are fully compliant in the dataset. There are significantly fewer hospitals in the competitive and moderately concentrated category than in the highly concentrated category



There are no hospitals in complete non-compliance; most are fully compliant or on their way to becoming fully compliant.



In 2018, the average charge-to-cost ratio was 3.87; in 2019, 3.87; in 2020, 3.80; in 2021, 3.88; and in 2022, 5.10.

2018 summary statistics

HHI Classification	Mean charge-to-cost ratio	Standard deviation	n
Competitive	4.39	2.15	37
Highly Competitive	4.87	2.38	569
Moderately Concentrated	6.00	3.01	105
Overall	3.87	2.59	2121

2019 summary statistics

HHI Classification	Mean charge-to-cost ratio	Standard deviation	n
Competitive	4.19	2.05	46
Highly Competitive	4.88	2.45	573
Moderately Concentrated	6.04	3.17	102
Overall	3.87	2.67	2092

2020 summary statistics

HHI Classification	Mean charge-to-cost ratio	Standard deviation	n
Competitive	4.11	2.12	37
Highly Competitive	4.79	2.48	571
Moderately Concentrated	5.88	3.27	105
overall	3.80	2.73	2050

2021 summary statistics

HHI Classification	Mean charge-to-cost ratio	Standard deviation	n
Competitive	4.26	2.20	38
Highly Competitive	4.93	2.53	581
Moderately Concentrated	6.18	3.50	109
Overall	3.88	2.69	2008

2022 summary statistics

HHI Classification	Mean charge-to-cost ratio	Standard deviation	n
Competitive	4.20	2.61	40
Highly Competitive	5.00	2.28	637
Moderately Concentrated	6.24	2.78	117
Overall	5.10	2.93	848



Empirical Method

Two empirical models are employed. In the first model, I will use a cross sectional dataset from the year 2022 to estimate an OLS model that shows how hospital markup, or charge-to-cost ratio, changes when hospitals become more compliant with HPT to the executive order. In the second model, I will use a panel dataset from the years 2018 to 2022 to estimate a difference-in-difference model to compare hospital markup changes between states with price transparency laws, prior to HPT and states without.

For both models, only hospitals that offer general health services are included to ensure a pool of homogenous hospitals. That is, I exclude hospitals affiliated with the U.S. Department of Veterans Affairs, specialty hospitals, rehabilitation hospitals, hospitals that only provide psychiatric care, hospitals located in the U.S. Indian reservations that exclusively cater to the Native American population, and charitable hospitals who offer services for free or at a significantly reduced rate due to charitable contributions from third party donors or other funding sources. These hospitals either have access to a consistent pool of external funding or offer only specialized services most hospitals do not provide.

Dependent Variable

I will use the charge-to-cost ratio as my dependent variable. certified hospitals have to disclose the total cost and charges where total costs are the costs that the hospital incur to provide services including unreimbursed care, charity care, and operating costs and total charges also known as service price is the service price that hospitals set for a service. The charge-to-cost ratio is a measurement of the mark up for services. If the charge-to-cost ratio is greater than 1, then the price charged to patients is greater than the costs the hospital incurs. If the charge-to-cost ratio is 3, then a given hospital charges three times more than it costs for a service. The charge-to-cost ratio is typically used by CMS to determine reimbursement rates but has been used in a measurement of price for studies examining the relationship between hospital features and pricing (Beauvais et al., 2020, Hilsenrath et al., 2015).

Independent Variable

In both models, I include controls for the number of interns, number of hospital beds, number of employees, hospital recommendation ratings, urban versus rural status, state fixed effects, and hospital and insurance market concentration as measured by HHI category.

To account for hospital types, such as community hospitals, research hospitals, or general service hospitals, I use the number of interns, employees, and hospital beds as proxies which I accessed from the CMS Hospital Provider Cost Report. Hospitals with fewer beds, employees, and interns are more likely to be community hospitals, while hospitals with larger bed counts and higher numbers of interns are more likely to be teaching or research hospitals. I also use an urban versus rural indicator from the CMS Hospital Provider Cost dataset that includes a dummy variable indicating whether a hospital is located in an urban or rural area to account for higher service prices in areas with limited provider availability (Lin et al., 2020).

To address hospital reputation, I will use the percentage of people who respond “definitely yes” when asked if they would recommend the hospital to someone else from the HCAPS dataset³.

State fixed effects, based on hospital addresses reported in the CMS Hospital Provider Cost Report, are included to account for variation in state-level policies that affect hospital pricing. States differ to the extent to which they regulate hospital charges through pricing caps and patient protection laws. For example, California’s Hospital Fair Pricing Act of 2006 limits the amount hospitals can charge underinsured or uninsured residents with incomes below 3.5 times the Federal Poverty Level (Place a Limit on Gross Charges for Patient Care Services or Items Set by Certain Private Hospitals [Ballot], 2015), whereas Missouri imposes no comparable limits on hospital charges (Bram Sable-Smith, 2023).

Finally, I include HHI categories to measure market competitiveness for both hospitals and insurance companies. These controls account for pricing variation arising from differences in local market competition. The hospital HHI accounts for the differing service prices hospitals



charge. Hospitals operating in highly competitive markets face greater pressure to offer lower service prices, while hospitals in less competitive markets may exercise greater market power and set higher service prices. The insurance HHI accounts for the prices that insured patients pay. In areas with limited competition among insurance companies, negotiated prices between hospitals and insurers tend to be higher than in markets with more competitive insurance markets. By accounting for HHI scores as a measurement of market competition for both hospitals and insurers, some of the variation in prices across the United States is captured. The Herfindahl–Hirschman Index (HHI) is calculated as the sum of the squared market shares of all firms in a given market and serves as a standard measure of market concentration. An HHI below 1,500 indicates a highly competitive market, an HHI between 1,500 and 2,500 reflects moderate concentration, and an HHI above 2,500 indicates a highly concentrated market with limited competition.

OLS regression model

The following is the cross sectional linear regression model using 2022 data.

$$Y_{js} = \beta_0 + X_j'\beta + \gamma_s + \mu_{js}$$

Where $Y_{js} = \frac{\text{charge}}{\text{cost}}$ for hospital j in state s and X_j are hospital characteristics (price transparency score*HHI category, indicator variable for if a hospital is an urban or rural area, number of hospital beds, number of hospital employees excluding interns and residents, number of interns and residents, percentage of patients that respond “definitely yes” when asked if they would recommend the hospital)

γ_s : state fixed effects

μ_{js} = unobservables

I use the year 2022 since it is the only year where the CMS, HCAPS, and CareJourney dataset are all publicly available. It is possible that price transparency impacts hospital behavior beyond 2022. As hospitals observe competitor’s service prices, they may alter their service prices past the year 2022. Patients might also start shopping

more as they become more aware of the ability to price shop. There may be a time lag in the policy, as patients may be unaware that they can price-shop or lack an incentive to do so, therefore the charge-to-cost ratio may change more in the future than what is being captured in 2022.

Difference-in-Difference model

To measure how price transparency affects prices over time, I will use a difference-in-differences model for the years 2018-2022. Before the federal transparency law was enacted in 2021, 27 states already had their own transparency laws. Because no state had a policy exactly like the executive order, I chose states for my treatment group that share similar aspects of the policy. I chose states where hospitals were required to report the procedure price for a given insurance plan to the patient upon request. I did not include states with “good faith estimate” price transparency laws, only prescription medicine transparency laws, or states where hospitals were only required to inform uninsured patients upon request, given that most patients have insurance coverage. The states that met the criteria were New Hampshire, Florida, and Montana, all of which had state transparency laws implemented before 2018. Hospitals in these three states are the control group in the difference-in-difference model. The hospitals in the control group should not notice a significant change in prices after the federal law’s implementation, since they were already required to have some degree of price transparency prior to the executive order. The treatment group are states without price transparency policies prior to the 2021 when the HPT was implemented and states with only pharmaceutical transparency laws or weak hospital transparency laws.

The degree of price transparency will not be included in the difference-in-differences model because data on how compliant hospitals were with price transparency laws were collected starting in 2022. The model will assume that hospitals in Montana, Florida, and New Hampshire were compliant with their state transparency laws before the federal law, and that hospitals in all states were compliant after the 2021 federal law. Given that no hospitals were in complete noncompliance in 2022 and the majority were fully compliant, the federal policy was integrated



by varying degrees across all hospitals observed.

Difference-in-difference model for years 2018-2022

$$y_{jst} = \alpha_j + \lambda_t + \beta (Prior_t \times Treat_s) + X'_{jt} \gamma + \epsilon_{jst}$$

Where:

y_{jst} : charge – to – cost ratio for hospital j in state s during year t

X'_{jt} : time varying hospital covariates(number of interns, recommend hospital, number of employees, HHI categories)

$Post_t$: equals 1 if $t \geq 2021$, 0 otherwise

$Treat_s$: equals 0 if state s had prior price transparency laws, 1 otherwise

α_j : hospital fixed effects

λ_t : year fixed effects

β : difference – in – difference estimate

Results

OLS Results

$$\frac{\text{charge}}{\text{cost}} = \beta_0 + \beta_1 \text{compliance score}$$

	Coefficient	Standard error
Intercept	0.285***	0.02
Compliance score	-0.008+	0.005
Number of reservations	791	
R-squared	0.003	

+ 10% significance, *5% significance, **1% significance, ***0.1% significance

$$\frac{\text{charge}}{\text{cost}} = \beta_0 + \beta_1 \text{compliance score} + \beta_2 \text{HHI Category} + \beta_3 \text{urban vs. rural} + \beta_4 \text{number of beds}$$

$$\beta_5 \text{number of employees} + \beta_6 \text{number of interns} + \beta_7 \text{recommend hospital} + \beta_8 \text{insurance HHI}$$

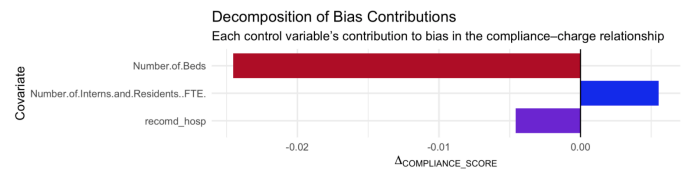
	Coefficient	Standard error	95% Confidence Interval	Actual coefficient for independent variable	95% Confidence Interval
Intercept	4.637*	1.938	(0.8322,8.4421)		
Compliance	-0.396	0.355	(-1.0933,0.3007)		
Compliance*Highly Concentrated (competitive is baseline)	0.510	0.371	(-0.2187,1.2392)	0.114	(-0.0953,0.3232)
Compliance*Moderately Concentrated (competitive is baseline)	0.505	0.417	(-0.3133,1.3227)	0.109	(-0.3289,0.5467)
Number of observations	791				
R-squared	0.330				
Adjusted R-squared	0.279				

Endogeneity

Oster bounds

beta*	0.0601
(beta*-beta controlled)^2	0.000305
Alternative Solution 1	83.7
(beta[AS1]-beta controlled)^2	6989
Uncontrolled coefficient	0.107
Controlled coefficient	0.0776
Uncontrolled R-square	0.00140
Controlled R-square	0.328
Max R-square	0.48

Gelbach Decomposition Results



	Delta compliance score
Number of beds	-0.0245
Number of interns and residents	0.00552
Recommend hospital	-0.00457
total	-0.0236

There are concerns about endogeneity with the OLS results, since hospitals with higher prices may not want to reveal their prices by publishing them all.

The results from the Oster bounds analysis show, in Table 4, without controlling for any other factors, a one-degree increase in price transparency is associated with a 0.107 increase in markup. After including observed controls, the estimated effect decreases to 0.0776, though it remains positive, suggesting that greater price transparency is still associated with a slight increase in markup.

The Gelbach decomposition, displayed in Table 5, provides more insight into which control variables drove down the coefficient change from 0.107 to 0.0776. It shows that the number of beds, a proxy for hospital size, is the largest contributor to the reduction in the coefficient from the uncontrolled to the controlled model, accounting for a decrease of approximately -0.0245. Other factors, including the number of interns and residents (0.00552) and the hospital recommendation score (-0.00457), also contribute, but to a smaller extent. Collectively, these



observed covariates explain nearly all of the change in the coefficient.

The analysis from the Oster bounds shows that unobserved factors would need to be 83.7 times stronger than the observed variables to reduce the effect to zero, and the potential bias from unobservable variables is very small at 0.000305. With a maximum R-squared of 0.48, the model explains a moderate portion of the variation in markup. These results suggest that while observed controls largely account for the change in the coefficient, the association between price transparency and markup is robust and unlikely to be driven by unobserved confounding variables.

Difference-in-difference 2018-2022

$$\frac{\text{charge}}{\text{cost}} = \beta_0 + \beta_1(\text{Prior}_s \times \text{Treat}_s) + \beta_2 \text{ number of interns} + \beta_3 \text{ number of employees} + \beta_4 \text{ recommend hospital} + \beta_5 \text{ HHI category}$$

	Coefficient	Standard error	95% confidence interval
Difference-in-difference	-0.2924	0.2845	(-0.8503,0.2654)
Highly concentrated(competitive is base)	1.402***	0.02513	(0.9090,1.8946)
Moderately concentrated(competitive is base)	1.727***	0.02665	(1.2047,2.2499)
Multiple R-squared(full model)	0.6473		
Adjusted multiple R-squared(full model)	0.5633		
F-statistic(full model)	7.704		
F-statistic(proj model)	23.57		

$$\frac{\text{charge}}{\text{cost}} = \beta_0 + \beta_1(\text{Prior}_s \times \text{Treat}_s) * \text{HHI Category} + \beta_2 \text{ number of interns} + \beta_3 \text{ number of employees} + \beta_4 \text{ recommend hospital} + \beta_5 \text{ HHI category}$$

	Coefficient	Standard error	95% confidence interval	Actual coefficient for independent variable	95% confidence interval
(Prior * Treat) for highly concentrated	-0.08237	0.3233	(-0.7162,0.5515)	-0.2943	(-0.8552,0.2667)
(Prior * Treat) for moderately concentrated	-0.1058	-0.3736	(-0.9393,0.6267)	-0.3177	(-0.9871,0.3516)
Multiple R-squared(full model)	0.6473				
Adjusted multiple R-squared(full model)	0.563				
F-statistic(full model)	7.676				
F-statistic(proj model)	17.686				

Analysis OLS

From Table 1, the results from the baseline OLS regression indicate that in 2022 there is a statistically significant linear relationship between price transparency and hospital markup. The average charge to cost ratio in 2022 was 5.10, with a standard deviation of 2.93. Specifically, a one unit increase in price transparency is associated with a 0.008 decrease in hospital markup.

After adding control variables in Table 2, including state fixed effects, urban versus rural status, number of beds, insurance HHI, hospital HHI, number of interns and residents, and the percentage of patients who recommend the hospital, the estimated coefficient increases in magnitude, implying that a one unit increase in price transparency is associated with a 0.078 decrease in hospital markup. However, this estimate is no longer statistically significant. The 95% confidence interval ranges from -0.1065 to 0.2613, indicating uncertainty around the estimate and allowing for either a decrease or an increase in hospital markup.

To test the hypothesis that price transparency increases prices in markets with few hospitals but decreases prices in markets with many hospitals, I estimated a separate OLS specification that interacted with hospital market concentration with price transparency. This interaction term captures whether the effect of price transparency on hospital markup



varies by the level of market competition. The results, shown in Table 3, indicate that, relative to competitive markets, a one unit increase in price transparency is associated with a 0.114 increase in hospital markup in highly concentrated markets and a 0.109 increase in moderately concentrated markets. However, neither of these estimates is statistically significant. Both coefficients are small, within one-tenth of a standard deviation, and suggest a positive relationship between price transparency and markup in more concentrated markets, though the estimates are imprecisely measured.

Difference-in-difference

The difference-in-difference model assumes that hospitals in Florida, New Hampshire, and Montana are fully compliant with the state transparency law. The parallel assumption does hold as shown in the graph in Appendix D. In the first difference-in-difference model, displayed in Table 6, the estimated coefficient indicates a -0.2924 change in hospital markup for hospitals subject to price transparency relative to hospitals without price transparency prior to 2021. However, this estimate is not statistically significant. The confidence interval $(-0.8503, 0.2654)$ shows substantial uncertainty, indicating that price transparency could be associated with a large decrease in or a modest increase in markup.

When interacting the difference-in-difference estimator with hospital market concentration in Table 7, the estimated coefficients are -0.2943 for highly concentrated markets and -0.3177 for moderately concentrated markets, relative to competitive markets. Both estimates are not statistically significant. These results suggest that, prior to 2021, hospitals in highly and moderately concentrated markets did not experience statistically significant differences in pricing between states with price transparency laws and states without such laws.

Conclusion

In general, the 2021 price transparency law did not have a significant impact on hospital prices as anticipated. Across market concentrations, hospital service markups remained largely unchanged as hospitals became more transparent. While many

patients consider price an important factor in their healthcare decisions, some may lack the incentives or ability to price-shop. Even when patients do not compare prices or choose the lowest-price hospital, hospitals may still benefit from transparency through the form of increased information. Requiring all hospitals to publish prices provides them with more information during negotiations with insurance companies, potentially increasing their bargaining power and enabling them to secure higher prices. Conversely, hospitals may lower prices to avoid being perceived as high-priced providers, particularly in highly competitive markets. The combination of price increases in some markets and decreases in others may explain why the OLS results covering hospitals nationwide show no significant change in hospital markup. This may be a short-run result, as hospitals are still getting into compliance and may change their prices once more hospitals in a given area increase their compliance with HPT.

The results may also be attributed to the low enforcement rate between 2021 and 2022. Limited enforcement by the Centers of Medicare and Medicaid likely reduced hospitals' incentives to prioritize compliance with the HPT, which may explain the lack of change in service prices as hospitals are not incentivized to change their behavior. However, the Trump administration has signaled an increase in hospital audits for compliance, which may lead to a greater number of hospitals moving toward full compliance in the future. In the long run, prices may move as hospitals become increasingly compliant.

The difference-in-differences results also indicate no significant change in hospital markup. This suggests that state level price transparency laws may have had little effect on markups relative to states without such laws. The lack of observed impact could reflect incomplete compliance among hospitals in Montana, Florida, and New Hampshire, and the limited sample size from these three states reduces the statistical power to detect meaningful effects. There is also no way to measure how compliant hospitals in Montana, Florida, and New Hampshire were to the state law, so it is possible that the markup for hospitals in the three states did not change with state transparency laws.



In future research, examining insurance negotiated rates as a measure of price could provide a more comprehensive understanding of hospital pricing behavior after the implementation of the HPT. Because negotiated rates directly reflect the outcomes of negotiations between insurers and hospitals, increased information symmetry resulting from price transparency policies may change negotiation dynamics, affecting prices. Furthermore, the majority of Americans are insured and do not pay the service price rate. Analyzing these negotiated rates would therefore help clarify whether transparency influences pricing through changes in bargaining power rather than through posted service prices alone. 2019 HEALTH

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