The Effects of Price Transparency Legislation on Hospital Profitability

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June 4, 2022

Abstract

I examine the effects of price transparency legislation on hospital financial performance. By exploiting the exogenous impact of the 2012 Massachusetts Cost Containment Law, I find that price transparency has a negative impact on operating and total margins in the short run. Although the effects are temporary, the magnitude of the impact is sizable enough to make the average hospital unprofitable, which could unintentionally harm healthcare access in rural and disadvantaged communities. I find a clear difference between short and long run effects of the law change, suggesting that hospitals respond to price transparency legislation. These results have implications for legislators when constructing and implementing price transparency rules in the future.
Acknowledgments

I offer my sincerest gratitude towards Molly Schnell for guiding and advising me throughout all aspects of the research and thesis writing process. I would like to thank my parents, Tingting and Jun, and my brother, Daniel, for shaping my academic and personal development and for always supporting me in times of need. I would also like to thank Kathy Chambery and Marilyn Haring for being great mentors since I was only a few years old.

Secondly, I would like to thank my friends for making Northwestern such a great experience. To my roommates--Jonathan, Daniel, and Samuel--thank you for being incredibly fun and weird people that motivate me with your daily shenanigans (and special shoutout to Jonathan for buying me Portillos when I was too deeply engrossed in STATA to get food). To my brothers at SigEp--thank you for being such inspirational people, both academically and otherwise. I would also like to thank my girlfriend, Sherry, for keeping me sane and happy while I spent hours at the MMSS lounge cleaning horrifically organized hospital data.

Finally, I would like to thank all my professors at Northwestern--and especially the MMSS faculty--for furthering my education and shaping me into a more well-rounded student.
1 Introduction

Over the last 60 years, healthcare expenditures in the United States have increased considerably, rising from just 5% of total consumer expenditures in 1960 to nearly 16% in 2020\(^1\). As a result of this massive increase, nearly half of insured Americans today have trouble paying for out of pocket expenses (Kearney et al. 2021), and almost 60% of personal bankruptcies cite medical bills as a direct contributing factor (Himmelstein 2019).

Spending more on healthcare is not necessarily bad; increased healthcare expenditures can promote the development of human capital and accelerate economic growth (Raghupathi et al. 2020). Compared to other wealthy countries, however, the United States spends far more per capita on healthcare while experiencing worse health outcomes and below-average life expectancies (Papanicolas et al. 2018, Schneider et al. 2017). Further, administrative costs account for 8% of U.S. healthcare spending—more than double that of Canada and eight times that of Japan. Since Americans aren’t receiving a higher quantity or quality of healthcare than counterparts in other wealthy countries, the primary explanation for higher expenditures is rising price levels.

The observed rise of healthcare prices in recent decades has been driven by widespread consolidation in hospital markets. From 2001 to 2011, an average of 66 hospital mergers and acquisitions occurred each year, increasing each local market’s Herfindahl Index by 19% (Cooper 2018). Aided by the difficulty for patients to compare prices between providers, hospitals in these less competitive markets were able to raise prices by an average of 12%, contributing to higher healthcare expenditures (Cooper 2018).

To help combat rising expenditures, both state and federal legislators have enacted various price transparency measures to encourage price competition between healthcare providers. On a federal level, beginning in 2015 the Affordable Care Act required hospitals to disclose general prices on their website. In 2019 the federal government further required that hospitals release prices of their highest and lowest in-network rates and established a

\(^1\)Percentages computed from consumer expenditures data made available by FRED.
maximum annual penalty of over $109,500 for noncompliance. Despite these two pieces of legislation, compliance amongst hospitals remains low–fewer than 1 in 6 hospitals were fully compliant as of 2022.\textsuperscript{2}

Unlike in many other markets, much of a hospital’s revenue comes from insurer reimbursements and not directly from the consumer. Given that these reimbursements are direct expenses for the insurer, one might suppose that insurers should be motivated to steer patients towards lower priced facilities. Indeed, some insurance startups–such as Bind Benefits and Turquoise Health–have attempted to offer greater price transparency and wider networks, but have not yet achieved enough scale to affect overall expenditures significantly. Most private payers, however, don’t have the right regulatory incentives to reduce costs. The Affordable Care Act’s minimum Medical Loss Ratio\textsuperscript{3} effectively capped insurer profit margins, thereby pushing insurers to pursue higher costs through more expensive claims (Cicala et al. 2019).

In this paper, I investigate the impacts of price transparency on hospital profitability by evaluating the effects of a 2012 Massachusetts law on operating and total margins of hospitals. While I am unable to make conclusions on whether the law impacted overall healthcare expenditures in Massachusetts, I find that operating and total margins decreased following the law’s implementation, suggesting a decrease in price levels.

2 Background

2.1 Why does price transparency matter?

Information asymmetries exist on many levels in healthcare. For one, providers of care usually have a better understanding of patients’ conditions than the patients themselves (Arrow

\textsuperscript{2}From the Semi-Annual Price Transparency Compliance report by PatientRightsAdvocate.org.

\textsuperscript{3}The ACA mandates that insurers use at least 80% of premiums on medical claims and ”efforts to improve the quality of care.” If the insurer does not meet this target, it is required to issue a rebate to customers.
1963). Secondly, patients usually don’t know how much a treatment costs until after receiving care, which eliminates the ability to price shop and increases search costs. Thirdly, although strict educational and medical licensing requirements for physicians eliminates significant variation in quality, patients do not know the true quality of each provider (Arrow 1963). While all three of these features contribute to the relative inefficiency of healthcare markets, having the ability to access pricing information before treatment is especially of importance for patients (Reinhardt 2014).

In recent years, the amount of cost sharing between patients and insurers has increased due to the rise of high deductible plans. By 2018, nearly half of workers were on high deductible plans, up from 15% in 2010. Patients that have to burden a higher share of healthcare costs should find pricing information more valuable.

Large price variation in healthcare also motivates the necessity for greater price transparency. Prices for the same treatment can often differ greatly between local hospitals and different insurance plans. At one hospital, patients covered with Aetna pay almost $700 more out-of-pocket for a colonoscopy than patients covered by Cigna, and nearly $1400 more than patients without insurance (Kliff 2021). Greater price transparency enables patients to not only price shop between different providers, but also select an insurance plan that better fits their needs.

2.2 Literature review

This topic is an extension of a large body of literature that studies informational frictions and search costs in markets. Through empirical observation and theoretical models, Stigler (1961) finds that ignorance in the consumer can lead to price dispersion for relatively homogenous goods. Salop and Stiglitz (1972) construct a model that assumes information is

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4 The IRS defines a high annual deductible as 1400 for individuals and 2800 for families.
5 From an Employee Benefits Survey conducted by the U.S. Bureau of Labor Statistics.
6 Employer-sponsored insurance usually offers only a few choices of carriers, restricting the amount of shopping that employees are able to do in health insurance markets. Some employers offer health reimbursement accounts (HRAs) for employees, in which case employees are able to pick an individual insurance plan and receive reimbursement from their employer for premiums.
costly but not impossible to obtain, and the result is the same: at points of equilibria relatively homogenous goods vary widely in prices. The results of these two studies also explain why healthcare has wide variation in prices for relatively homogenous services.\(^7\)

Another dynamic restricting competition in healthcare markets is insurance networks.\(^8\) Literature examining welfare effects of restricted choice—such as Ho (2006)—have found that moving from restricted networks to unrestricted hospital choice significantly increases consumer surplus while simultaneously reducing producer surplus.\(^9\) This result illustrates that consumers in healthcare markets are willing to shop around, underscoring the potential effectiveness for price transparency measures.

Works studying the effects of price transparency initiatives are fewer in number since such legislation did not take place until recently. An early example of transparency legislation is New Hampshire’s 2003 law, which mandated the collection of pricing data to create a centralized price transparency website. Using web traffic from the New Hampshire website, Brown (2019b) constructs a model of demand that includes three outpatient medical imaging services. Overall, Brown (2019b) finds a modest 5% reduction in prices, and an even smaller 1.7% reduction in price dispersion. In order to estimate demand, Brown (2019b) assumes that each visit to the website is a unique individual and that those who use the website are fully informed. These assumptions illustrate a problem commonly encountered in the literature: it is difficult to measure the usage of price transparency tools directly.

Another limitation of trying to measure usage of price transparency tools is that people have different insurance plans with different deductibles and copayments. Depending on the structure of an insurance plan, there can be seasonal differences in how people utilize pricing information: towards the beginning of the year, those with high-deductible health

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\(^7\)In healthcare consumers do not have access to precise pricing information—Brown (2019b) finds empirical evidence that the difference between patient beliefs and true prices is on average 29 percent.

\(^8\)Typical insurance plans cover only certain providers (“in-network”). HMO (Health Maintenance Organization) plans do not pay any claims from out-of-network providers. PPO (Preferred Provider Organization) plans partially cover out-of-network provider claims, but nonetheless still restrict patient choice.

\(^9\)Often times providers make decisions for patients on where to receive care—e.g. doctor referrals—therefore, unrestricted hospital choice is unlikely to be an option for any patient.
plans (HDHPs) utilize pricing tools frequently, but towards the end of the year, those enrolled on HDHPs will have met their deductible and have less incentive to use these tools. Lieber (2017) finds that these seasonal effects can account for a 90 percent reduction in the likelihood of searching for pricing information.

Rather than estimating usage of price transparency tools directly, Christensen et al. (2013) examines effects of price transparency regulation using a difference-in-differences approach across multiple states. Christensen et al. (2013) finds a similar 5% reduction in the price of hip replacements. However, since Christensen et al. (2013) uses a geographic scope beyond New Hampshire, only hospital charge prices are used, which often have no bearing on the final price billed to the insurer and the patient. Deciding which prices are relevant and obtaining consistent pricing data is another significant limitation for the literature. Lieber (2017) also utilizes a difference-in-differences approach in assessing prices paid for care by employees of a large corporation. By utilizing a relatively smaller experiment, Lieber (2017) partially solves the difficulty of obtaining and selecting relevant pricing data. The work also estimates price reductions for a greater number of treatments, including inpatient and emergency care. Lieber (2017) finds an overall reduction of 1.6% in prices paid for inpatient care, but no reduction in those of emergency care.

Other studies have found price transparency to be limited in its effectiveness. One paper studying two large corporations offering pricing tools found that there was limited adoption of such tools among patients and almost no difference in outpatient spending (Desai et al. 2016). Desai et al. (2021) went as far as running a campaign to promote the New Hampshire price transparency tool, successfully boosting usage of the website by 600 percent, but ultimately found no increase in the use of lower-price providers.

Some of the literature argues price transparency could potentially increase prices. Because of the difficulty of measuring and obtaining information surrounding the quality of different healthcare providers, patients may infer quality from the prices of treatments (Sinaiko 2010). In fact, Waber et al. (2008) demonstrates patients may even respond better to treat-
ments that have higher price tags via the placebo effect. Furthermore, doctor referrals can
discourage switching to low-cost facilities, and therefore decrease price elasticities for treat-
ments. If previously low-cost providers observe new information about relatively inelastic
demand, they may raise their prices in response (Sinaiko 2011).

I build upon the existing literature by examining the effects of price transparency from a
provider financial perspective. Due to the difficulty of obtaining relevant prices and estimat-
ing consumer utilization of price transparency tools, I analyze the profitability of hospitals
as a proxy for price levels. Through a difference-in-differences model, I find that price trans-
parency has a negative effect on hospital profits in the short run, but these effects disappear
within 5 years.

2.3 Discussion of Massachusetts’s “Chapter 224”

In this study I examine the effects of Massachusetts’s 2012 Healthcare Cost Containment
Law, commonly known as “Chapter 224.” The law had several aims, including expand-
ing price transparency for consumers, establishing data-collecting agencies, and encouraging
adoption of value-based payment systems (as opposed to itemized fee-for-service methodolo-
gies). Prior to the passage of the law, Massachusetts faced the highest per capita healthcare
spending out of any state in the United States (Hattis 2017). The state’s outsized spending
was primarily driven by utilization of higher-priced healthcare. In particular, Massachusetts’s
hospital inpatient admission rate was 5 to 13% higher than the U.S. as a whole\textsuperscript{10}. Oddly
enough, patients primarily sought inpatient care at hospitals with above-average prices (Hat-
tis 2017), with many people leaving their home county to seek care at academic hospitals in
Metro Boston, where prices were much higher. The uniquely high inpatient admissions rate
coupled with over-utilization of higher-priced hospitals led to fast increases in healthcare
spending.

Chapter 224’s price transparency measures attempt to combat this issue. Since its imple-
\textsuperscript{10}Estimated from Hattis 2017; original data is from America Hospital Association and CHIA.
mentation in early 2014, the law has required hospitals to provide price estimates to patients in under 2 business days. Chapter 224 further requires that insurers and other carriers provide a website and toll free number to inform patients of their maximum co-pays, a clause implemented later in 2014.\footnote{The rules requiring insurers to release co-pay prices took effect on October 1st, 2014. Since hospitals often gave wide-ranging estimates (Bebinger 2014), insurer co-pay prices were likely more valuable to patients.}

Unlike New Hampshire’s equivalent law, Chapter 224 does not establish a centralized website for price comparisons, instead delegating the responsibility to individual hospitals and insurers. The absence of a centralized website makes it more difficult for patients to access pricing information, but may allow for more up-to-date pricing information from insurers. Notably, Chapter 224 was the first law in the United States to mandate insurers provide co-pay prices. Since over 97% of the state is insured, insurer co-pays are the most relevant prices for patients in Massachusetts (Yang 2021). Previous legislation in New Hampshire and other states had only mandated that hospitals release prices, which are less relevant for insured patients.

Hospital compliance with Chapter 224 and other price transparency laws has been poor. Surveys from 2015—a year after the legislation was implemented—suggested that obtaining prices was a long and cumbersome process taking up to 6 or 7 business days to complete, far more than the 2 business days required by law (Anthony 2017). The aforementioned 2020 federal price transparency rule had even worse compliance, with just 5% of surveyed hospitals in full compliance a year after its passage.\footnote{Survey by Patient Rights Advocate from its Semi-Annual Hospital Price Transparency Compliance Report (July 2021)}
3 Data

3.1 Data Sources

For my analysis, I utilize hospital-level cost data provided by the Massachusetts Center for Health Information and Analysis (CHIA) and audited financial statements from individual acute care hospitals during the years 2009-2018.

The primary response variable of interest is the operating margins of hospitals, commonly used by hospital financial literature (Ly et al. 2018, O’Hanlon et al. 2019). Unlike bottom line accounting profit or other margins used in financial analysis (EBITDA, NOPAT), hospital operating margins\(^{13}\) only include revenues and costs associated with patient care and operating activities. Other sources of revenues and costs, in particular those that arise from capital structure decisions and endowment returns, are not as relevant to this study and are unlikely to have responded to the legislation.

These financial statements also include individual streams of revenues by department and service (e.g. emergency care, neurology) as well as utilization and capacity of facilities. The statements also include a breakdown of sources of costs and the number of employees in each department, though these data are less pertinent to the discussion.

From this data, I constructed a balanced panel of 58 hospitals over a 10 year period, resulting in 580 observations. Numerous acquisitions occurred during this time period, and all hospitals that changed names were assigned their 2013 name for the purposes of tracking them throughout time. Nine hospitals did not have data for the entire 10 years–either because of non-reporting or because they closed–and were thus dropped from the sample. Although dropping permanently closed hospitals could bias the results, it is unlikely that their closure had much to do with the recently implemented price transparency legislation.\(^{14}\)

Unlike much of the literature, I do not utilize any pricing data. It is difficult to decide

\(^{13}\)I do not calculate margins in my analysis; all margins used are reported by CHIA.

\(^{14}\)In some instances, the hospital closed in the pre-period.
which price\textsuperscript{15} is relevant to the typical consumer, and comprehensive pricing data prior to the legislation is unobtainable. I also do not utilize data surrounding adoption of price transparency tools. Unlike in New Hampshire, the Massachusetts law did not establish a central website or database of prices that patients could access, making it difficult to estimate usage of the law as Brown (2019b) did via web traffic data.

3.2 Summary Statistics

Table 1 shows the summary statistics for all 58 hospitals in the sample from fiscal year 2009 through 2018. The mean hospital in Massachusetts is a large organization, collecting over 375 million USD of net patient revenue per year and having on average 267 beds available. Gross revenue is significantly higher than net patient revenue because it represents revenue from charge rates, whereas net patient revenue is adjusted by contractual discounts between hospitals and insurers.\textsuperscript{16}

Hospitals in Massachusetts are not very profitable: the average hospital has a total margin of just 3%, though this is fairly consistent with averages across the country (Ly et al. 2018).\textsuperscript{17} Data on hospital capacity and utilization reveals interesting trends—some hospitals are only at 29% occupancy, while the busiest ones are at more than 100% occupancy on average. This points towards the statewide trend of rural residents migrating to metro areas for healthcare (Hattis 2017).

\textsuperscript{15}Hospitals maintain various rates for each treatment, including chargemaster rates, Medicare and Medicaid rates, private insurer-negotiated rates, and cash pay rates.

\textsuperscript{16}This demonstrates the disconnect between posted hospital charge rates and what payers actually pay, further underscoring the difficulty in using prices in the analysis.

\textsuperscript{17}In fact, Massachusetts hospitals outperform the average U.S. hospital; in 2013 the average U.S. hospital had a clinical operating margin of -2.7% (Ly et al. 2018).

\textsuperscript{18}More than 17% of available beds are not staffed, suggesting some hospitals might not be equipped to handle surges in patients.
3.3 Levels of non-emergency care

In my study, I define the level of non-emergency care\(^{19}\) as the proportion of gross patient revenue from non-emergency care:

\[
Prop_{NonER} = \frac{GrossPatientRev_{NonER}}{GrossPatientRev}
\]

Importantly, there is significant variation in the level of non-emergency care between hospitals, ranging from just over 40% to 100% of revenue. The large variation in non-emergency care in Massachusetts hospitals makes the empirical strategy employed in this study possible. Ideally, because gross revenue is derived from charge rates and not negotiated rates, we would calculate proportions of non-emergency care using net patient revenue instead, but a detailed breakdown of net revenue by service is not available in the dataset. If payers in Massachusetts received proportionally higher or lower contractual discounts on emergency services than in other services, then these computed proportions could misrepresent how much each hospital truly depends on non-emergency care.

4 Empirical Strategy

In situations requiring emergency care, patients are inelastic to prices (Ellis et al. 2017) and will often choose the provider closest to them (Smith et al. 2017). Patients are therefore less likely to price shop for emergency care (Lieber 2017).

Furthermore, Chapter 224 stipulates that hospitals have a 48 hour window to provide prices to patients. Even assuming full compliance by hospitals, this means that no patient seeking emergency care will be able to access pricing information from hospitals before receiving care. Although patients can still find pricing information online with their insurers, this feature of the law makes it more difficult for patients to price shop when requiring emergency care. The difficulty of price shopping while seeking emergency care introduces variation into how Chapter 224’s price transparency rules affect different hospitals. In par-

\(^{19}\)Non-emergency care is defined as care that does not take place in an emergency care setting. Proportions were computed with data from 2013, the year before the law change was implemented.
ticular, hospitals that receive less of their revenue from emergency care services will be more affected by price transparency legislation. Some other services have similarly low price elasticities (Ellis et al. 2017), but are not included in the analysis for simplicity.

The significant variation in the level of non-emergency care (See Figure 1) observed between hospitals in Massachusetts allows for a difference-in-differences analysis. Formally, I regress both the operating and total margins of hospitals on the level of non-emergency care interacted with the post period:

\[
y_{nct} = \gamma_n + \gamma_t + \beta_1 \times Post_{t \geq 2014} \times Prop_{NonER_n}^{2013} + \beta_c \times X_{ct} + \epsilon_{nct}
\]

For hospital \( c \) at year \( t \). I include hospital and year fixed effects to account for hospital-specific features and macro-level economic trends. If the law change did indeed have an impact on margins and prices, we expect to see a significant decrease in margins for hospitals with higher levels of non-emergency care.

5 Results

5.1 Graphical evidence

I first examine graphically the impact of the law change. In Figure 2, I split up hospitals by quartiles of non-emergency care and plot the mean operating margins of each quartile, weighted by hospital bed size. Before the law change—denoted by the vertical marker—the highest quartile moves similarly to the other quartiles. After the law change, we observe a clear difference in the movement of the highest quartile’s margins: from 2013 to 2014, its margins increased by less than the other 3 quartiles, and from 2014 to 2015, its margins moved in the opposite direction of the other quartiles. In other words, hospitals with the greatest proportion of non-emergency care on average experienced decreases in operating margins relative to counterparts, suggesting that Chapter 224 had an impact on margins.

\footnote{Dialysis and surgeries in particular also feature near-zero elasticies (Ellis et al. 2017).}

\footnote{It could be worthwhile to construct a proportion of non price-elastic care as the main source of variation.
Though I weighted the means by bed size, thereby eliminating much of the noise of smaller hospitals, it is possible that a few outlier hospitals decreased the mean of quartile 4 significantly. Figure 3 shows the operating margins of each hospital, grouped by quartile. While there is variation in how much each hospital’s margins changed, there are no significant outliers in the highest quartile. This further emphasizes that the law change was responsible for the relative decrease in operating margins seen in the highest quartile of non-emergency care. These results continue to hold true when we examine total margins of hospitals in each quartile; in fact differences between quartiles are even more pronounced for total margins than for operating margins.\footnote{See Appendix: Figure A.}

It is important to note that quartile 4’s divergence from other hospitals disappears relatively quickly; Figure 2 shows that quartile 4’s margins return to trend by 2017-2018. This suggests that the effects of price transparency legislation may not persist past the short run, motivating the use of an event study analysis.

5.2 Event Study

In order to study the effects of the legislation in each post-period year, I construct an event study analysis. Formally, I interact a dummy variable of each year in the sample with the proportion of non-emergency care and regress operating margins on the interaction variable:

$$y_{nct} = \gamma_n + \gamma_t + \beta_t \times Year_t \times Prop_{NonER_n}^{2013} + \beta_c \times X_{ct} + \epsilon_{nct}$$

If the choice of non-emergency care as the explanatory variable is valid, we expect to see the event study coefficients centered around 0 prior to 2014. Secondly, if the law change had any effect, we expect to see negative coefficients after the law change.

Figure 4 displays the results of the event study analysis and confirms what we saw graphically. With the exception of 2009, coefficients before 2014 were centered around 0. After the law change, coefficients became sharply negative from 2014 to 2016, before rebounding to original coefficient levels of around 0 by 2017.\footnote{2013 was set as the baseline year and dropped from the event study because of collinearity.}
Figure 4 suggests that hospitals with higher levels of non-emergency care experienced decreases in operating margins relative to peers from 2014 to 2016. By 2017, these effects disappear, creating a clear distinction between short and long run effects of the law change.

It is not surprising to see that the effects increase in magnitude from 2014 to 2015 and 2016. The second part of the price transparency law, which requires insurers to release prices instantly, wasn’t implemented until late 2014. Further, we can expect adoption and utilization of price transparency tools to increase over time as groups continue to advertise them (Desai et al. 2021).

A potential concern with the results of Figure 4 is the significant negative coefficient in 2009.\textsuperscript{24} Indeed, 2009 was the year of the financial crisis and recession, which negatively affected consumer demand. Since demand for emergency care is inelastic to both price and income changes (Ellis et. al 2017), it is likely that the recession more adversely impacted hospitals with higher levels of non-emergency care. If this assumption is true, then any large macroeconomic shock will likely affect non-emergency care more adversely, pointing to a drawback of using it as the explanatory variable.

5.3 Regression Results

Table 2 displays the regression results, where short run is defined as the 3 years after the law change, long run is defined as years 4 and 5, and ”All Post” refers to all 5 years after the law change. For both operating and total margins, there is a significant negative coefficient in the short run, but an insignificant positive coefficient in years 4 and 5. The results are all insignificant for the non-weighted regressions, but this is likely because of noise introduced by smaller hospitals in the sample.

The results of Table 2 suggest that hospitals whose revenue comes entirely from non-emergency care saw a 9.3% decrease in operating margins compared to hospitals that operate entirely with emergency care. For a hospital with mean levels of non-emergency care (83.2%)
this translates to a 7.7% decrease in operating margins. Given that the average hospital has operating margins of around 2%, the magnitude of the law’s impact could send the typical hospital into financial distress.

Similarly, the law had a negative impact on total margins, decreasing the average hospital’s total margin by nearly 10%. It is somewhat surprising that total margins were affected more by the law change than operating margins; one might expect price transparency legislation not to affect sources of non-operating revenues and expenses beyond raising potential compliance costs.

The negative effects don’t persist past 2016, however, and results for the entire post period show no significant effect on operating or total margins. This may be encouraging for hospital executives that fear the impacts of price transparency, but calls into question the efficacy of such legislation in lowering the overall price of healthcare.

6 Discussion

From my analysis, I find a 7.7% decrease in operating margins and a 10% decrease in total margins in the short run for the average hospital in the sample. The magnitude of these results align with previous studies that find a 5% reduction in prices. While margins and prices don’t correspond perfectly, it is reasonable to assume that the decrease in margins also coincided with a decrease in the overall price levels of hospitals in Massachusetts.

Hospitals already struggle financially, with one CBO study concluding that as many as 41% of hospitals will be unprofitable by 2025 (Hayford et al. 2016). Though average operating margins haven’t decreased in recent years, the tails of the distribution are getting longer (Ly et al. 2018). In particular, rural hospitals and those that primarily serve Medicare and Medicaid patients are more financially strained (O’Hanlon et al. 2019, Friedman et al. 2004). Given the catastrophic effects of the initial months of COVID-19 on hospital financial health (Kaye et al. 2021, Graves et al. 2021), a 3 year decrease in margins resulting from

\(^{25}\)Congressional Budget Office.
price transparency legislation could be enough to send some hospitals into bankruptcy.

This feature of the hospital market raises equity concerns with regards to price transparency legislation. If price transparency significantly lowers margins, will already struggling rural hospitals be more affected? Will hospitals that primarily serve less affluent and older communities suffer? If the effects of price transparency are so severe that these hospitals shut down, there could be adverse effects on healthcare access in relatively disadvantaged communities. While my analysis cannot address the issue of equitable impacts, this topic certainly merits further discussion.

It is also difficult to extend the results of my analysis to analyze the effects of Chapter 224 on consumer welfare and overall patient healthcare expenditures—which is arguably the focus of price transparency legislation. A decrease in margins likely indicates lower prices, but since the majority of Massachusetts patients are insured, the agents benefiting from a short run decrease in prices may be the insurers rather than patients—especially if insurers take years to adjust their premiums.

This distinction between short and long run effects is an important result of my analysis. While I cannot fully explain the mechanisms behind the rebound in margins after year 3, it is clear that hospitals are responding and adjusting to the law change. Previous literature suggests that hospitals have several strategies to respond to changes in the price level, such as upcoding patients to more severe conditions and serving more privately-insured patients as opposed to publicly-insured ones (Dafny 2005, Bazzoli & Clement 2014). With the increasing number of MBA-graduates running hospitals, there is evidence that hospitals are becoming better run businesses (Bloom et al.), and thus more adept at responding to legislation.

The fleeting nature of these results underscore the reality that price transparency legislation alone may not be enough to address unsustainable healthcare spending. Recent legislation, including the Massachusetts law, have aimed to shift payment models away from fee-for-service models to ones based on patient outcomes. With government payers repre-
senting an increasing share of hospital revenues, shifts to value-based payment models seem likely, but will take years to implement (Brown & Crapo 2017).

With regards to Massachusetts’s Chapter 224, I did not include the legislation’s goal of cutting hospital costs. Omitting this feature of the law is unlikely to bias the results unless cost cutting impacted emergency care differently than other medical services. If cost cutting efforts were in fact concentrated in emergency care settings, it could explain some of the rebound in margins that we observe in years 4 and 5. Data on hospital costs support this possibility; growth in salary costs flattened from 2016 onward, although total costs continued to rise.\(^{26}\)

My study has several other limitations. First, I am unable to estimate compliance with the Massachusetts law. As with previous legislative acts, the penalties for noncompliance may not be high enough to incentivize hospitals and insurers to post prices, especially if doing so may negatively impact their margins.

Secondly, I do not incorporate whether patients know about or frequently use price transparency tools. Although patients generally have non-zero price elasticities for non-emergency services, the relative cost of obtaining prices may still prevent patients from actually price shopping, especially for patients with a zero-deductible health plan. Furthermore, prospect theory suggests that consumers may be less price elastic for expensive goods and services, which may also disincentivize patients from price shopping (Kahneman & Tversky 1979).

Lastly, levels of non-emergency care may not be an entirely robust source of variation, especially given its sensitivity towards major macroeconomic events. There is potentially problematic collinearity between non-emergency care and the size of hospitals; the largest hospitals seemingly concentrate around the 90% level of non-emergency care.\(^{27}\) For robustness, my paper would ideally include a similar difference-in-differences analysis that compares hospitals across state boundaries, as is typical with the broader economic literature. Unfortunately, the relatively few number of hospitals on Massachusetts’s border makes it

\(^{26}\)See Appendix: Figure D.
\(^{27}\)See Appendix: Figure E.
challenging to execute such a strategy.

Beyond state boundaries, several other sources of variation exist that could serve to further validate or challenge the results presented in this study. Several free market surgery centers around the country—for example the Surgery Center of Oklahoma—started publishing prices before any related legislation. These providers would be an ideal control group in an analysis similar to the one I present in my paper, although not enough free market providers presently operate in Massachusetts to study Chapter 224’s effects. One might also examine how chronic care centers were affected by price transparency rules—perhaps patients are more willing to price shop when they have to visit a provider multiple times.

7 Conclusion

I find that Massachusetts’s price transparency legislation had a significant, negative effect on hospital margins in the short run. In the long run, these effects disappear, potentially because of hospitals responding to the legislation. While these results may be encouraging to legislators who wish to curb the growth of healthcare prices, further analysis into the impact of the law on disadvantaged communities and consumer welfare is required before conclusions surrounding price transparency legislation can be drawn.
References


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### Table 1: Summary Statistics

<table>
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<th>Variable</th>
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<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
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<td>Salary Costs</td>
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<td>2.39E+08</td>
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<td>Emergency Costs</td>
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<td>Emergency Revenue</td>
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<td>Gross Revenue</td>
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<td>8.61E+08</td>
<td>1.20E+09</td>
<td>52458805</td>
<td>6.94E+09</td>
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<td>Available Beds</td>
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<td>232.49</td>
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<td>Staffed Beds</td>
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<td>187.97</td>
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<td>Licensed Beds</td>
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<td>Available Bed Days</td>
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<td>Inpatient Days</td>
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<td>53037.1</td>
<td>57366.42</td>
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<td>Percentage Occupied</td>
<td>580</td>
<td>66.46</td>
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Table 2: Regression Results

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<th>Operating Margins</th>
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<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
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<tr>
<td>Short Run</td>
<td>-0.093*</td>
<td>-0.057</td>
<td>-0.12*</td>
<td>-0.066</td>
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<td>(-2.12)</td>
<td>(-0.87)</td>
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<td>(-0.94)</td>
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<tr>
<td>Long Run</td>
<td>0.041</td>
<td>0.085</td>
<td>0.026</td>
<td>0.080</td>
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<td>(0.67)</td>
<td>(1.08)</td>
<td>(0.41)</td>
<td>(0.96)</td>
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<td>All Post</td>
<td>-0.040</td>
<td>0.000</td>
<td>-0.061</td>
<td>-0.008</td>
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<td>(-0.83)</td>
<td>(0.00)</td>
<td>(-1.14)</td>
<td>(-0.11)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.027***</td>
<td>0.027***</td>
<td>0.021***</td>
<td>0.045***</td>
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<td>(7.15)</td>
<td>(7.16)</td>
<td>(6.99)</td>
<td>(11.81)</td>
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<td>580</td>
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<td>$R^2$</td>
<td>0.649</td>
<td>0.642</td>
<td>0.636</td>
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</table>

$t$ statistics in parentheses

All models include hospital and year fixed effects

Columns 1, 2, 3, 4 regress on operating margins, the rest on total margins

Columns 1, 2, 5, 6 are weighted by bed size

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Figures

Figure 1: K-density of non-emergency care in 2013

Proportion of revenue from non-emergency care
Figure 2: Mean operating margins by quartile
Figure 3: Operating margins by quartile of non-emergency care
Figure 4: Event study on operating margins

Law implemented in 2014
Appendix

Figure A: Mean total margins by quartile of non-emergency care
Figure B: Total margins by quartile of non-emergency care

Quartile 1

Quartile 2

Quartile 3

Quartile 4
Figure C: Event study on total margins

Law implemented in 2014
Figure D: Costs over time
Figure E: Costs, revenue over proportion of non-emergency care