

The Interaction between Optimal Medical Malpractice Law and Physicians' Financial Incentives*

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Abstract

The impacts of malpractice regulations and financial incentives for providers are typically studied independently. In this paper, I show that in order to make both positive and normative statements about medical malpractice liability, one must consider the legal and financial incentives faced by healthcare providers jointly. I develop a simple model of physician behavior to show that the effect of tort reforms on treatment decisions depends critically on physicians' financial incentives. When treatment is not profitable at the margin, liability reduction leads to a decrease in treatment levels; conversely when treatment is profitable, liability reduction leads to an increase in treatment levels. Motivated by this simple theoretical framework, I analyze the impact of a tort reform in Texas that reduced malpractice liability on C-section rates and common pediatric surgical procedures. Consistent with the theory, the data show that the rate of C-sections for commercially insured mothers, which are thought to be profitable, increase by about 2% relative to the rate of C-sections for mothers on Medicaid, which are considered to be unprofitable. Similarly, the reform increases the incidence of profitable pediatric procedures relative to unprofitable ones. These findings help explain why the existing literature on optimal medical malpractice law is inconclusive and underscore the importance of understanding the economic incentives at play when designing legal regulations.

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1 Introduction

It is often argued that there is too much medical malpractice liability, and that healthcare providers deliver excessive, low-benefit treatment because of fear of malpractice lawsuits. This view is consistent with evidence from self-reported data according to which, defensive medicine is very common (Studdert et al. (2005), Reyes (2010)). This view suggests that optimal medical malpractice law is very important, and a growing body of literature is trying to study the relationship between medical malpractice law and healthcare provision. Nevertheless, the mechanisms driving the response of medical treatment to malpractice law are not well-understood, and the empirical evidence about the magnitude of the response is mixed, providing little normative direction.

A separate body of literature studies the response of healthcare providers to financial incentives. The theory and evidence in this area show that when healthcare providers bear the cost of performing procedures, they tend to perform fewer procedures. The treatment of Medicare patients, under the Prospective Payment System, is a well-known example of such a situation (see Ellis and McGuire (1986)). In contrast, when procedures are profitable, like in the case of a Fee For Service reimbursement system, providers tend to perform more of them (see Ellis and McGuire (1993)).

This paper investigates the interaction between healthcare providers' financial incentives and their response to malpractice law. Its key result is that the role medical malpractice liability plays in health care providers' decisions varies according to the financial incentives they face. When providers bear the cost of the marginal treatment, they tend to provide too little care; malpractice liability offsets this tendency and increases the amount of treatment provided. When providers' marginal procedure is profitable, they tend to provide unnecessary, low-benefit care; malpractice liability offsets this tendency and decreases the amount of care provided.

Using a simple model of providers' behavior I show that the effect of a tort reform

on treatment depends on healthcare providers' financial incentives. In particular, liability reduction leads to a decrease in treatment level when treatment is not profitable. Conversely, liability reduction leads to an increase in treatment level when treatment is profitable. The intuition behind this result is that when treatment is costly, it is provided excessively due to fear of legal liability. Consequently a decrease in liability leads to a decrease in treatment level. On the other hand, when treatment is profitable, providers tend to shower patients with unnecessary low-benefit care, and a liability-decreasing reform would only exacerbate this tendency.

The distinction between the role of medical malpractice law under different providers' financial incentives is important because it emphasizes that optimal malpractice law depends crucially on the financial incentives of healthcare providers. If high healthcare expenditures are driven by fear of litigation, reducing liability may help curb excessive treatment. On the other hand, if high healthcare expenditures are driven by the profitability of healthcare, reducing liability will only make things worse.

I test the predictions of the model using a large tort reform which took place in Texas in June 2003 ("the reform"). The reform is attractive because it limited damage amounts for which providers may be liable, which substantially lowered the liability risk faced by healthcare providers (Hyman et al. (2009)).

The financial incentives faced by healthcare providers are not typically observed directly. To address this problem, I follow previous studies which use the distinction between commercially insured patients and those insured by Medicaid, which is known to pay low rates compared to commercial insurers. I use the heterogeneity in physicians' financial incentives that is created by the differences in generosity in reimbursement rates between commercial insurance carriers and Medicaid as a proxy for providers' financial incentives. Using this approach, I cannot separately identify the effect of the reform on patients under each insurance type. The main testable prediction offered by the model is that following a liability decreasing reform, the treatment levels of the two insurance type groups would diverge.

I study two medical procedure classes. First, I estimate the effect of the reform on the likelihood of undergoing a C-section. While in the aggregate it appears as if the reform did not have an effect on the overall incidence of C-sections, analyzing the effect of the reform by insurance type reveals that C-section rates increase by 2% for commercially insured mothers relative to mothers insured by Medicaid. This effect comes mostly from low-risk births, for which providers are more likely to be sensitive to financial incentives, supporting the causal role of the reform.

Second, I examine the effect of the reform on the incidence of common pediatric surgeries. I cannot directly observe which procedures are more attractive to providers, so I analyze the effect of the reform in two stages. The first, I generate a measure of the attractiveness of each procedure based on revealed preferences. Using the notion that during the weekend there is a tendency to perform only necessary procedures, I proxy attractiveness by higher weekday proportion of procedures relative to the weekend. The second, I match the procedure's measured attractiveness with the procedure's incidence, following the reform. Consistent with the model, I find that, following the reform, attractive procedures are associated with a larger increase in their incidence.

This paper helps to reconcile the gap between the modest effect of malpractice law, typically measured in the literature and the evidence from self-reported data, which suggest that defensive medicine is very common. In particular, this paper shows that a small aggregate response to medical malpractice law may be the sum of offsetting responses associated with different financial incentives. This paper makes it clear that the effect of malpractice law on medical treatment is best analyzed by separately considering situations according to the type of financial incentives at play.

The remainder of the paper is organized as follows. Section two provides a literature review. Section three presents a simple model of providers' decision making. Section four describes the data that is used for the study, the empirical design and results and section five concludes.

2 Literature Review

In early empirical work on the effect of liability pressure on treatment, Brennan et al. (2004) find that total costs per discharge are larger in hospitals that face higher claim rates (see Kessler and Rubinfeld (2007) for more examples from early literature). In a seminal paper, Kessler and McClellan (1996) examine the effect of malpractice pressure by studying the impact of two broad classes of tort reforms on medical costs and on outcomes for a population of elderly heart patients. They find that while tort reforms have no significant effect on health outcomes, they significantly reduce medical costs, which they interpret as evidence for defensive medicine. Kessler and McClellan (2002a) extend their work and find that both managed care and liability reduce procedure use without affecting health outcomes. In another follow up paper, Kessler and McClellan (2002b) find that increases in malpractice pressure lead to significant increases in diagnostic expenditures but not in therapeutic expenditures. Recently Sloan and Shadle (2009) revisited the results of Kessler and McClellan (1996) finding no significant affect of tort reforms on medical decisions at all.

Baicker et al. (2007) find that greater liability pressure is associated with greater expenditures on diagnostic tests. Lakdawalla and Seabury (2009) exploit variation in the generosity of local juries to identify the causal impact of liability pressure on medical costs and mortality, finding that liability pressure is associated with improved outcomes (namely, reductions in patient mortality).

In the context of childbirth, Dubay et al. (1999) find that when malpractice pressure is higher, physicians perform more C-sections, especially on mothers of lower socioeconomic status with no evidence for better outcomes. Kim (2007) finds that, the performance of C-sections and the use of ultrasound, forceps and vacuum, is insensitive to measures of liability pressure such as the number of obstetrician claims per 1,000 births. Using tort reforms, Currie and MacLeod (2008) find that malpractice pressure affects both treatment decisions and patient outcomes. They show that Joint and Several Liability reforms reduce

complications of labor and procedure use, whereas caps on noneconomic damages increase them.

3 Theory

I study a model of a representative healthcare provider's behavior closely related to Ellis and McGuire (1986). Providers' utility function is assumed to include patients' benefits, providers' financial incentives and expected medical malpractice liability. I demonstrate that two types of over-treatment may arise and analyze how they are affected by malpractice liability.

3.1 Patients

Let $B(q)$ be patients' benefits from health treatment, in dollar terms. As in Ellis and McGuire (1986) it is assumed that there a single input to healthcare, q , and that patients accept any treatment prescribed by the provider. The benefit function is assumed to satisfy

Condition 1 $B(q)$ is concave, and reaches a maximum at some quantity q' , after which total benefits fall.

Benefits to the patients, are assumed to be equal to the full social benefit from treatment. Note that, because of the social costs that are associated with treatment, the socially optimal treatment level, q^* , is lower than the maximum benefits treatment level $q^* < q'$.

3.2 Providers

Profits, $\pi(q)$, capture the providers' financial incentives which are associated with treatment. Two broad cases are considered. The first is profitable treatment ("Fee For Service (FFS)

type incentives”)

$$\pi = D(q) \tag{1}$$

where marginal profit in this case, $d(q)$, satisfies $d(q) \geq 0$, $d'(q) \leq 0$. More broadly this profit structure captures situations where additional treatment is profitable. The second case is non profitable treatment (“Prospective Payment System (PPS) type incentive”)

$$\pi = -C(q) \tag{2}$$

where marginal cost in this case, $c(q)$, satisfies $c(q) \geq 0$, $c'(q) \geq 0$. This profit structure may fit any treatment decision for which providers bear costs.

$P(q)$ is the probability of facing medical malpractice liability. It is assumed that the function $P(q)$ satisfies the following condition:

Condition 2 $P(q)$ is convex, reaches a minimum at q' , and increases after that point

Intuitively, medical malpractice liability system aligns the patient’s benefits with the provider’s incentives. When the provider’s decision increases the patient’s benefits it also decreases the likelihood of malpractice liability. H is the expected cost of facing medical malpractice liability. Note that in practice providers are typically insured against malpractice claims payments, so the costs associated with litigation which enter H include time loss, damage to reputation, promotion, etc. (see discussion in Currie and MacLeod (2008)). For simplicity, providers are assumed to be risk neutral with respect to medical malpractice liability. Providers’ utility is given by

$$U(q, H) = V(\pi(q), B(q)) - L(P(q)H) \tag{3}$$

where V is a concave function of $\pi(\cdot)$ and $B(\cdot)$ and L is a convex function of $P(q)H$.

3.3 Providers’ behavior

The provider problem is

$$\max_q V(\pi(q), B(q)) - L(P(q)H)$$

and the solution is given by the first order condition

$$\alpha \frac{d\pi}{dq} + b(q) - \beta p(q)H = 0 \quad (4)$$

where $b(q)$ is marginal patient benefits, $p(q)$ is the marginal probability of facing liability, $\alpha = \frac{\frac{\partial V}{\partial \pi}}{\frac{\partial V}{\partial B}} = MRS_{B\pi}$, and $\beta = \frac{\frac{\partial L}{\partial (P \cdot H)}}{\frac{\partial V}{\partial B}}$. Intuitively α reflects the rate at which a provider is willing to trade a dollar of profit for a dollar of patient benefits. Analogously β reflects the rate at which a provider is willing to trade a dollar of patient benefits with a dollar of expected malpractice liability. One reason to think that $\alpha \neq \beta$ is that the provider's financial incentives reflect a combination of physician incentives and hospital incentives while the fear of liability might reflect only the physician's liability costs.

3.3.1 Non Profitable Treatment

When providers' profits are given by (2), the first order condition in (4) becomes

$$-\alpha c(q) + b(q) - \beta p(q)H = 0. \quad (5)$$

Note that under PPS type incentives providers set $q < q'$. Intuitively, suppose that q' is provided, a very small decrease in q would not affect patients benefits and the likelihood of facing malpractice liability because $b(q')$ and $p(q')$ both equal zero, but it would decrease treatment costs.

It is easy to show that, under PPS type incentives, there exists a unique H^* such that the social optimum is attained, that is characterized by

$$-\alpha c(q^*) + b(q^*) - \beta p(q^*)H^* = 0. \quad (6)$$

This implies that under PPS type incentives, two regions of provision exist. The first, when $H < H^*$, is the *under-provision region*, $0 < q < q^*$, where too little care is provided due to low liability pressure and high cost of treatment. The second, when $H > H^*$, is the *defensive medicine region*, $q^* < q < q'$, a region in which low-benefit healthcare is provided due to high liability pressure as illustrated in Figure 1.

3.3.2 Profitable Treatment

When profits are given by (1), the first order condition in (4) becomes

$$\alpha d(q) + b(q) - \beta p(q)H = 0 \tag{7}$$

When providers face Fee For Service type incentives, they provide care in the region $q > q'$, the *profit-seeking region*. Intuitively, so long as $q \leq q'$, there is no trade-off in treatment provision. Increasing q increases patient benefits and profit and decreases likelihood of malpractice liability. Only when $q > q'$, a trade-off emerges. While additional treatment is profitable, it decreases patient benefits and increases the likelihood of facing medical malpractice liability.

3.3.3 The Effect of a Tort Reform

Consider now the effect of a tort reform on providers' behavior for the two types of financial incentives. Intuitively, Under PPS type incentives, financial considerations tend to lower treatment intensity and malpractice law offsets this tendency. An increase in malpractice liability pressure would lead to an increase in treatment intensity. In contrast, under Fee For Service type incentives, financial consideration tend to raise treatment intensity and malpractice law decreases this tendency. In this case, an increase in liability leads to a decrease in treatment intensity. The intuition is summarized by the following proposition.

Proposition 1. *Under conditions 1 and 2, The effect of an increase in expected costs of facing malpractice liability depends on providers' financial incentives. When providers face PPS (Fee For Service) type incentives, an increase in expected cost of facing malpractice liability decreases (increases) healthcare provision.*

Proof of Proposition 1. The logic of the proposition is straightforward. For PPS type incentives, providers bear the cost of treatment and they trade off this cost with their benefits from additional treatment, which include both patient benefits and lower expected costs of malpractice liability. As the cost of medical malpractice goes up, providers tend to provide more medical treatment. The logic for Fee For Service type incentives is similar. See Appendix A for the detailed proof.

The analysis above distinguishes between three regions of treatment: under-provision, defensive medicine and profit seeking medicine. It is important to distinguish between the different types of treatment for optimal medical malpractice policy. Under defensive medicine, physicians provide an excessive level of care due to fear of lawsuits, so it is desirable to reduce malpractice liability. In the profit seeking region, low-benefit care is provided because it is profitable and despite the exposure to malpractice liability. In the region of under provision, low levels of care are provided because of its costs and despite the loss of benefits to patients and the exposure to malpractice liability. In both of these cases an increase in liability pressure is desirable.

The corollary below captures this intuition, showing that when there is over-provision of health care, it is important to distinguish between defensive medicine and profit seeking medicine.

Corollary 1. *The welfare effect of a liability decreasing tort reform when $q > q^*$ depends on providers' financial incentives. When providers face PPS (Fee For Service) type incentives, a decrease in expected costs of facing medical malpractice liability increases (decreases) social welfare.*

Proof of corollary 1. A liability decreasing tort reform moves society towards the social optimum q^* , when providers face PPS type incentives and away from the social optimum q^* when providers face Fee For Service type incentives. QED.

4 Empirical Analysis

The objective of the empirical analysis is to study the relationship between treatment intensity and tort reforms under PPS and under Fee For Service type incentives. Unfortunately, financial incentives faced by providers are typically unobservable, making it challenging to address the question without making additional assumptions.

I contrast two important cases for which $\pi(q)$ is likely to be of the PPS type and Fee For Service type, respectively. In particular, I adopt an approach often used in the literature on providers' response to financial incentives. Medicaid reimbursement to providers is much less generous than commercial insurance reimbursement (see Zuckerman et al. (2009) and for the case of Texas see e.g. Davila et al. (2002)). Holding other things equal, the differential payoff (i.e. reimbursement net of costs) to providers who treat Medicaid patients is more likely to be negative whereas the differential payoff for providers who treat patients insured by a commercial carrier is likely to be positive. Using this notion, Currie and Gruber (2001) show that the lower fee differentials between C-section and vaginal childbirth under Medicaid than under commercial insurance are associated with lower C-section rates for Medicaid mothers. Gruber et al. (1999) find that the lower fee differentials can explain between one half and three-quarters of the difference between Medicaid and commercial C-section rates.

Relying on this approach, I study the change in treatment intensity following the reform for patients insured by a commercial carrier and for patients under Medicaid. With this approach I cannot separately identify the effect of the reform on each insurance type. The model shows that following a liability decreasing tort reform, there is a differential response to the reform for patients under different insurance types. The incidence of procedures for

patients insured by a commercial carrier would increase while the incidence of procedures for patients under Medicaid would decrease. Hence, the main testable prediction that the theoretical analysis offers is that there will be a divergence in treatment levels between the two insurance types.

I study areas for which both Medicaid and commercial insurance are common, and take two approaches to test the model's hypothesis. The first approach focuses on childbirth, one of the most common medical procedures that is thought to have a high sensitivity to medical malpractice liability pressure (Smarr (1997)). The second approach is to analyze common childhood surgical procedures, another area that is regarded to be highly sensitive to malpractice liability pressure (McAbee et al. (2008), Fanaroff (2010)).

4.1 Background - Texas Tort Reform

In June 1 2003, Texas passed a tort reform reducing malpractice liability by capping noneconomic damages in medical malpractice claims. Texas law requires a constitutional amendment authorizing the legislature to determine limits for noneconomic damages in healthcare liability claims. This necessary constitutional amendment was adopted by the voters on September 13, 2003 and was preceded by months of a fierce public debate on which opposing sides spent approximately twenty million dollars (Roberson and Torbenson (2007)).

The reform imposed a cap on noneconomic damages¹ in medical malpractice cases filed after September 1, 2003. The cap limits noneconomic damages against physicians and other individuals who are licensed healthcare providers to \$250,000². Furthermore, the reform made a number of changes in the procedures regarding medical malpractice claims. An

¹“Noneconomic damages” means damages for physical pain and suffering, mental or emotional pain or anguish, loss of consortium, disfigurement, physical impairment, loss of companionship and society, inconvenience, loss of enjoyment of life, injury to reputation, and all other nonpecuniary losses other than exemplary damages.

²All the cap amounts mentioned here are nominal and not adjusted for inflation. A separate \$250,000 cap applies to each hospital, with total noneconomic damages capped at \$500,000 for all health care facilities.

important change is that a claimant must now file, within 120 days after the claim is filed, an expert report, a written report by an expert regarding the expert’s opinion concerning how the standard of care rendered by the physician or healthcare provider failed to meet applicable standards and the causal relationship to the harm suffered by the claimant. Generally, such experts must be physicians or persons in the same occupation as the healthcare provider.

A recent study by Silver et al. (2008) uses claim level data to estimate the effect of the reform on jury verdicts, post-verdict payouts, and settlements. Using simulations based on medical malpractice cases closed during 1988–2004, they find that the cap affects 47-percent of verdicts and substantially reduces the mean of noneconomic damages and verdicts. They also find that in cases settled without trial, the noneconomic cap reduces predicted mean total payout by 18-percent. Their evidence confirms that the reform has a large impact on medical malpractice pressure in Texas. More generally, Avraham (2007) finds that liability decreasing reforms tend to reduce the number of cases and average awards.

4.2 Childbirth Analysis

As mentioned above, there is a body of evidence showing that C-sections are sensitive to providers’ financial incentives that are generated by the difference in reimbursement rates between commercial insurances and Medicaid (Gruber et al. (1999), Currie and Gruber (2001)). This makes the decision to perform a C-section a potentially good candidate to study the response of providers to tort reforms when they face different financial incentives. I study the effect of the reform on the decision to perform a C-section rather than a vaginal birth.

I use a standard differences in differences methodology:

$$C\text{-}section_{ist} = a + Quarter_t + Insurance_s + b_1 Char_{ist} + b_2 Insurance * Reform + b_3 Hosp + \varepsilon_{ist} \quad (8)$$

where the estimates of the coefficient $Insurance * Reform$ capture the relative effect of the Texas reform on the probability of performing a C-section by type of insurance. $Char$ is a vector of the mother's personal characteristics, $Quarter$ is a vector of dummy variable for each quarter in the relevant time period, $Hosp$ is a vector of dummy variables for each hospital.

4.2.1 Data

I use the deliveries in the periods 2000Q1-2007Q4 for mothers aged of 25-34³ from the Texas Public Use Data File (PUDF). California Patient Discharge Data and Florida Inpatient Data are used as control groups. The data contain information on patient demographics, length of stay, discharge status (alive or dead), diagnosis (including primary and secondary ICD-9CM and diagnosis related group (DRG) codes), source of payment, and procedure codes. The data also include discharge quarter and hospital identification number.

Table 1 shows descriptive statistics of the Texas, Florida, and the California populations for mothers insured commercially and for mothers insured by Medicaid. In all three states, The rate of Afro-American and Hispanic mothers is higher among Medicaid mothers and Medicaid mothers are also more likely to have undergone a previous C-section.

Figure 2 plots C-section rates for Texas, Florida and California for the periods 2000Q1-2007Q4. The figure shows that C-section rates in Texas, Florida and California are increasing steadily during the sample period. C-section rates in California are lower than C-section rates in Texas and Florida by roughly 4% and C-section rates in Florida appear to be growing slightly faster than C-section rates in Texas. Based on the raw data it does not appear that there is a striking effect of the Texas reform on the aggregate level of C-section rates.

4.2.2 Results

³The reason to choose this age group is that in Texas, about 80% of mothers under 25 are insured by Medicaid and about 80% of mothers above 34 are commercially insured. Focusing on ages 25-34 generates a sample that is more comparable.

Figures 3(a)-(c) plot C-section rates for commercially insured mothers and for mothers insured by Medicaid in Texas, Florida and California. Figure 3(a) suggests that prior to the reform, C-section rates for the two insurance types in Texas are similar and they both follow a similar time trend. Following the reform, the increase in C-section rates for Medicaid appears to slow down while commercial insurance C-section rates appear to maintain the same trend. C-section levels for the two types of insurances diverge. In contrast, as Figure 3(b)-(c) show, in Florida and California Medicaid and commercial C-section rates appear to follow a similar trend.

The baseline regression estimation results are summarized in columns (1)-(3) of Table 2. Consistent with the graphic illustration, the estimates reveal that following the reform, the overall incidence of C-sections for mothers insured by a commercial insurance carrier relative to mothers insured by Medicaid, increased by approximately 2%. Columns (4)-(9) of Table 2, show the estimates from placebo regressions for Florida and California. There is no statistically significant evidence of an increase in the incidence of C-sections following the reform in those two states. In Florida, there is a small positive coefficient that is marginally insignificant. This result is consistent with Figure 2(b) which shows a small increase in the gap between C-section rates of commercially insured mothers and mothers under Medicaid in Florida. The pattern may be explained by a “softer” liability decreasing reform in Florida at the end of 2003. The Florida reform set a cap of noneconomic damages at \$500,000, and may have had a similar but smaller effect on C-section rates in that state (see Avraham (2006)).

The model predicts that the reform would have a stronger effect on treatment when $\frac{\partial b(q)}{\partial q}$ is smaller. Intuitively, other things being equal, when patients’ benefits are more sensitive to treatment decisions, the financial incentives have a smaller effect on treatment. In order to examine the validity of the results, I divide the sample into high-risk and low-risk groups⁴

⁴High-risk is defined as one of the following diagnoses: Previous C-section, breech position, early onset, polyhydramnios, oligohydramnios, obesity, diabetes, multiple gestation, distress, hypertension and

and compare the relative effect of the reform on mothers insured by a commercial carrier and mothers under Medicaid, for the high-risk and the low-risk groups (i.e. test whether $\frac{\partial q}{\partial H}|_{high\ risk} < \frac{\partial q}{\partial H}|_{low\ risk}$).

Figures 4(a)-(b) plot C-section rates of commercially insured mothers and mothers insured by Medicaid, for the low-risk and high-risk groups, respectively. The figures show that, consistent with the model, the divergence in C-section rates between commercially insured mothers and mothers under Medicaid, appears to be larger for low-risk births.

Table 3 summarizes the regression estimation results for this specification. As Figure 3 suggests, There is a statistically significant difference between the effect of the reform on high-risk and low-risk mothers. For low-risk mothers, following a liability decreasing reform, the overall incidence of C-sections for commercially insured mothers relative to mothers insured by Medicaid increased by approximately 2.3% while for high-risk mothers it increased by about 1.3%, supporting the causal role of the reform.

In summary, analysis of the response of C-section rates to the reform shows a divergence in C-section rates between the commercial and Medicaid groups. The causal effect of the reform in this result is supported by the fact that the response is stronger in low-risk mothers than it is in high-risk mothers. The results suggest that the response to the tort reform indeed depends on providers' financial incentives.

4.3 Common Pediatric Surgery Analysis

In this section, I augment the empirical analysis with a second approach, studying the effect of the reform on the incidence of common pediatric surgical procedures. As in the case of childbirth, I cannot directly observe providers' financial incentives, and furthermore, other considerations in the providers' decisions to perform surgery such as patient benefits are also unobserved, making it impossible to know how attractive a given procedure is in the eyes

hemorrhage.

of the healthcare provider. In order to overcome this problem I use revealed preferences to recover the relative attractiveness of pediatric surgeries. Like in the previous section, the analysis exploits the fact that it is more profitable to treat a commercially insured patient than a patient under Medicaid. I create a proxy for a procedure's attractiveness based on the notion that in the weekend there is a tendency to perform only necessary surgeries. That is, compared to weekday surgeries, weekend surgeries are less likely to depend on the financial incentives a procedure offers (see Card et al. (2009)). Therefore, a higher weekday proportion of commercial insurance patients relative to Medicaid patients, suggests that commercial insurance provides stronger financial incentive to perform the procedure.

Using the attractiveness proxy, I test the hypothesis that following the reform procedures with high attractiveness would be associated with an increase in the share of patients insured by a commercial provider relative to procedures with low attractiveness. Intuitively, high attractiveness procedures are prevalent during the weekdays, revealing that they are preferred by providers. The liability decreasing reform is expected to magnify the tendency to perform these procedures. Conversely, unattractive procedures have a similar proportion on weekdays reflecting the fact that providers are not interested or are not able to perform a higher number of those procedures. Therefore following the reform these procedures are not expected to demonstrate a change in the proportion of commercially insured patients.

The empirical analysis therefore has two stages. In the first stage, a proxy for per-procedure relative attractiveness is estimated. In the second stage, the differential association between a procedure's attractiveness and the effect of the reform on the proportion of patients insured by a commercial carrier is tested.

First stage: To generate the proxy, I first calculate the ratio of weekend procedures to total procedures for patients insured by a commercial carrier and for patients under Medicaid, during a period of 4 years before the reform. I then calculate the difference in the log of the

commercial and the Medicaid ratios. Namely,

$$Attractiveness(procedure_i) = \log\left(\frac{weekend\#}{total\#}\right)_{comm} - \log\left(\frac{weekend\#}{total\#}\right)_{aid} \quad (9)$$

As explained above, a high proxy implies that providers tend to perform a large number of procedures for commercially insured patients during the week, suggesting that the procedure is attractive.

Second stage: In the second stage, the association between attractiveness and the effect of the reform on the proportion of patients under a commercial insurance is tested using two estimation equations. In the first equation, I pool procedures into three groups: high, medium and low, by their attractiveness. I then regress:

$$\log\left(\frac{comm_{ijt}}{aid_{ijt}}\right) = Hosp_j + Year_t + Procedure_i + \gamma \cdot index_gr * Post_reform + \varepsilon_{ijt} \quad (10)$$

where $\log\left(\frac{comm_{ijt}}{aid_{ijt}}\right)$ is the ratio of commercially insured patients to patients insured by Medicaid in a hospital-procedure-year cell, $Hosp_j$ is a vector of hospital dummies, $Year_t$ is a vector of year dummies, $Procedure_i$ is a vector of procedure indicators and $index_gr * Post_reform$ is the attractiveness group multiplied by an indicator for the reform. The second equation is

$$\log\left(\frac{comm_{ijt}}{aid_{ijt}}\right) = Hosp_j + Year_t + Procedure_i + \gamma \cdot Attractiveness * Post_reform + \varepsilon_{ijt} \quad (11)$$

where $Attractiveness * post_reform$ is the attractiveness proxy multiplied by an indicator for the reform. The model predicts that $\gamma > 0$, reflecting a differential response to the reform based on physicians' incentives that are proxied by the Attractiveness measure.

4.3.1 Data

Sample generation. For this part too, the Texas Public Use Data File (PUDF) is used. The California Patient Discharge Data is used to create the placebo tests. I extract discharges for which, the ICD9 code of the main procedure corresponds to one of the common pediatric surgical procedures in the US⁵. Only patients aged nineteen or less are included in the data. Table 4 shows summary statistic for the data. Note that, the median age in the Medicaid sample is smaller and has a higher rate of Hispanic and African-American patients in both states.

The Attractiveness index. I generate the proxy by applying the formula (9) to a sixteen quarter period prior to the reform. In order to use discharges for which the timing of admission is related to the main procedure performed, I include only discharges for which the procedure was done in the first two days of admission and I eliminate newborns. I eliminate procedures with attractiveness proxies that are larger than 0.5 or smaller than -0.5, which are outliers caused by very low weekend incidence. Table 7 includes the list of the procedures by their attractiveness group.

4.3.2 Results

Figure 4(a) plots $\log(\frac{comm_{ijt}}{aid_{ijt}})$ of high attractiveness procedures and $\log(\frac{comm_{ijt}}{aid_{ijt}})$ of low attractiveness procedures against time, controlling for hospital fixed effects. To generate the figure, I regressed $\log(\frac{comm_{ijt}}{aid_{ijt}})$ on a vector *yearXindex_gr* dummies and hospital fixed effects, and plotted the regression coefficients for the period 1999-2007 for the high attractiveness and low attractiveness groups, omitting the medium attractiveness group. The figure shows that relative to the omitted medium attractiveness group the proportion of commercially insured patients in high attractiveness procedures increased following the reform while the proportion of low attractiveness procedures remained unchanged.

⁵See appendix B for a detailed description of the generation of the common surgical procedures in the United States list.

The estimates of equation (10) are displayed in column (1) of Table 5. In columns (2) of Table 5 a hospital year interaction is added to control for local trends in Medicaid enrollment. The estimates in columns (1) - (2) of Table 5 show that there is a statistically significant difference between the effect of the reform on the high attractiveness and the low attractiveness groups: while the reform had a positive and significant effect on the proportion of commercially insured patients for the case of high attractiveness group, it had no effect on the proportion of commercially insured patients low attractiveness group.

Columns (3)-(4) of Table 5 report results from a placebo regressions which replicate the regressions in columns (1)-(2) for a fictitious reform in the first quarter of 2001 and for the time period 1999-2002. The results of the placebo reform are statistically insignificant. Columns (5)-(6) of Table 5 report results from a placebo regression using the California data. Each procedure in this specification was assigned the Texas attractiveness proxy and a fictitious 2003 reform in California was analyzed. The results of this regression are statistically insignificant as well, showing that the observed effect is not driven by a trend in treatment patterns of particular procedures.

Figure 6(a) plots the percentage change in the ratio of patients insured by a commercial carrier to patients insured by Medicaid following the reform, against the attractiveness proxy. In order to generate the figure, I first ran a regression with hospital and year fixed effects similar to (11). I then pooled procedures' attractiveness proxies into 0.05 wide bins and for each bin computed the mean difference in $\log(\frac{comm_{ijt}}{aid_{ijt}})$ following the reform (between 2002 and 2004). The mean difference was plotted against median bin value and a linear fit line was added. Figures 6(b) is a placebo test. It is constructed in an analogous way using a fictitious reform which took place in the beginning of 2001. Figure 6(c) is another placebo test that is using the California data as a placebo test analogous to the one done to generate Figure 5(b).

Figure 6(a) shows that, consistent with the prediction of the model, the reform has a differential effect on $\log(\frac{comm_{ijt}}{aid_{ijt}})$. Higher attractiveness is associated with a larger increase

in the proportion of commercially insured patients. Figure 6(b) shows that following the fictitious reform in 2001 there doesn't seem to be a differential change in $\log(\frac{comm_{ijt}}{aid_{ijt}})$. Figure 4(c) shows that there doesn't seem to be a parallel differential change in $\log(\frac{comm_{ijt}}{aid_{ijt}})$ in California, implying that the effect in Figure 6(a) is not driven by a trend in treatment patterns of particular procedures.

The estimates of equation (11) are displayed in column (1) of Table 6. In columns (2) of Table 6, a hospital year interaction is added to control for local trends in Medicaid enrollment. The estimates in columns (1)-(2) of Table 5 show a positive and statistically significant coefficient for γ . Columns (3) and (4) of Table 5 show the estimates of a fictitious reform in 2001. The estimates are small and insignificant. Columns (5)-(6) of Table 6 show the estimates of another placebo test that is using the California data as a placebo test analogous to the one done in Table 5.

This section shows that in the case of pediatric surgery the response to the reform is concentrated among procedures that are revealed to be attractive from the provider perspective based on the pre-reform period. The results in this section provide additional support to the idea that the response of treatment to malpractice law depends on providers' financial incentives.

5 Conclusions

Using a simple model I have shown in this paper that the relationship between medical malpractice law and medical treatment depends crucially on the financial incentives faced by healthcare providers. Medical malpractice law plays a different role in regulating the ex-ante behavior of healthcare providers, under different financial incentives. When high healthcare expenditures are driven by fear of litigation, reducing liability may help curb excessive treatment. On the other hand, when high healthcare expenditures are the result of the profitability of healthcare provision, a liability reduction would only make things worse.

Using a large liability reducing tort reform in Texas, I examine the effect of medical malpractice liability-reduction on medical treatment for the case of childbirth and for the case of pediatric surgeries. In the case of childbirth, I find that C-sections in commercially insured mothers become more prevalent. In common pediatric surgeries, the incidence of procedures that are likely to be attractive in commercially insured patients, increases for that group.

Interestingly, Currie and MacLeod (2008) find an increase in C-section rates following similar reforms which put caps on noneconomic damages. Their result is surprising, since C-sections are regarded as a conservative and more expensive treatment relative to vaginal birth. The finding in this paper may be viewed as providing the “micro foundations” for their result by showing that when C-sections are likely to be profitable, C-section rates are expected to increase following a reduction in malpractice liability. This response may offset other effects of the reform resulting in an overall increase in C-section rates.

Finally, The results in this paper may help reconcile the gap between the modest effects that are typically measured in the literature on the relationship between malpractice law and treatment and the evidence from self-reported data, according to which defensive medicine is very common. In particular, it shows that a small aggregate response to malpractice law may be the sum of offsetting responses arising from different types of financial incentives.

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Appendix A

Proof of Proposition 1. To see the first part of the proposition, one can find the effect of a change in H on q under PPS by totally differentiating (5) w.r.t H

$$\begin{aligned}
 -\alpha \frac{\partial c(q)}{\partial q} \frac{\partial q}{\partial H} + \frac{\partial b(q)}{\partial q} \frac{\partial q}{\partial H} - \beta \left[\frac{\partial p(q)}{\partial q} \frac{\partial q}{\partial H} H + p(q) \right] &= 0 \\
 \frac{\partial q}{\partial H} &= \frac{\beta p(q)}{\left[-\alpha \frac{\partial c(q)}{\partial q} + \frac{\partial b(q)}{\partial q} - \beta \frac{\partial p(q)}{\partial q} H \right]} \Rightarrow (12) \\
 \frac{\partial q}{\partial H} &> 0
 \end{aligned}$$

similarly, to see the second half totally differentiating (7) w.r.t H

$$\begin{aligned}
 \alpha \frac{\partial d(q)}{\partial q} \frac{\partial q}{\partial H} + \frac{\partial b(q)}{\partial q} \frac{\partial q}{\partial H} + \beta \left[\frac{\partial p(q)}{\partial q} \frac{\partial q}{\partial H} H + p(q) \right] &= 0 \\
 \frac{\partial q}{\partial H} &= \frac{\beta p(q)}{\left[\alpha \frac{\partial d(q)}{\partial q} + \frac{\partial b(q)}{\partial q} - \beta \frac{\partial p(q)}{\partial q} H \right]} \Rightarrow (13) \\
 \frac{\partial q}{\partial H} &< 0.
 \end{aligned}$$

QED.

Appendix B

Generation of the common procedure list. Using the Healthcare Cost and Utilization Project database year 2000 sample, I extracted a list of pediatric procedures with incidence of more than 500 cases. Of the hundred most common pediatric procedures in the US by age group, I kept only procedures with ICD9 codes which represent an inpatient surgery (i.e. I eliminated diagnostic tests and non surgical procedures). The sixty most common surgeries in the sample were included in the final list. The full list of procedures by their attractiveness proxy group appears in Table 7.

TABLE 1

Summary Statistics Childbirth Sample

	Texas		California		Florida	
	Medicaid	Commercial	Medicaid	Commercial	Medicaid	commercial
Age (mean)	30-34	30-34	25-29	30-34	25-29	30-34
Mother Hispanic	64.1%	23.7%	64.8%	23.1%	30.6%	16.9%
Mother African American	10.5%	7.8%	4.4%	2.3%	26.7%	11.9%
Mother Other Race	25.4%	68.5%	30.8%	74.6%	42.7%	71.2%
Previous C-section	22.3%	16.3%	20.0%	13.3%	19.9%	15.2%
Breech	2.8%	3.4%	2.7%	3.3%	3.2%	3.8%
Early Onset	7.3%	6.5%	6.2%	5.8%	8.3%	6.8%
Hemorrhage	1.6%	1.6%	1.7%	1.6%	2.2%	1.8%
Hypertension	4.5%	4.7%	3.4%	3.5%	5.1%	4.9%
Distress	0.2%	0.4%	0.6%	0.6%	0.3%	0.4%
Multiple Gestation	0.9%	1.2%	0.8%	1.1%	1.1%	1.3%
Diabetes	1.2%	0.8%	0.9%	0.7%	1.1%	0.7%
Obesity	0.5%	0.3%	0.5%	0.4%	0.6%	0.3%
Oligohydramnios	3.1%	2.2%	2.5%	2.4%	2.8%	2.5%
Polyhydramnios	0.5%	0.7%	0.5%	0.4%	0.8%	0.8%
Observations	465,261	600,759	742,324	1,140,892	242,333	444,476

NOTE: Sample includes mothers between ages 25-34 insured by a commercial carrier or by Medicaid in the period 1999-Q1 to 2007q4 using the Texas California and Florida Inpatient Data respectively.

TABLE 2

The Effect of a Liability Decreasing Reform, Diff in Diff Estimates: TX, CA and FL

	Texas			California			Florida		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ReformXInsurance	0.0209 (0.0051)	0.0194 (0.0046)	0.0175 (0.0029)	-0.0032 (0.0027)	-0.0032 (0.0024)	-0.0031 0.0025	0.0049 (0.0042)	0.0069 (0.0037)	0.0068 (0.0036)
Insurance type	yes	yes	yes	yes	yes	yes	yes	yes	yes
Risk Group	No	No	yes	No	No	yes	No	No	yes
Quarter	yes	yes	yes	yes	yes	yes	yes	yes	yes
Age, Race	No	No	yes	No	No	yes	No	No	yes
Hospital FE	No	yes	yes	No	yes	yes	No	yes	yes
Observations	1,059,818	1,059,818	1,056,541	1,883,216	1,883,216	1,597,030	686,809	686,809	686,809

NOTE: Standard errors clustered at the physician level for Texas and Florida and at the Hospital level for California, are reported in parentheses. Each regression includes a constant. Dependent variable in all models is the indicator for C-section.

TABLE 3

The Effect of a Liability Decreasing Reform, Diff in Diff Estimates
by Risk Group

	(1)	(2)	(3)
ReformXInsuranceXHigh	0.0145 (0.0055)	0.0128 (0.0048)	0.0134 (0.0049)
ReformXInsurance_Low	0.0234 (0.0031)	0.0223 (0.0029)	0.0226 (0.0029)
Insurance type	yes	yes	yes
Risk Group	yes	yes	yes
Risk GroupXInsurance	yes	yes	yes
Quarter	yes	yes	yes
Age, Race	No	No	yes
Hospital FE	No	yes	yes
Observations	1,059,818	1,059,818	1,056,541
F-test for Equality of Reform Effect (Prob>F)	0.058	0.044	0.054

NOTE: High-risk group is defined as a discharge with at least one of the following diagnoses: Previous C-section, breech position, early onset, polyhydramnios, oligohydramnios, obesity, diabetes, multiple gestation, distress, hypertension and hemorrhage. Low-risk is defined as any discharge that is not high risk. Standard errors clustered at the physician level, are reported in parentheses. Each regression includes a constant. Dependent variable in all models is the indicator for C-section.

TABLE 4
Summary Statistics Pediatric Surgeries Sample

	Texas		California	
	Medicaid	Commercial	Medicaid	Commercial
Age (median)	5-9	10-14	5-9	10-14
Hispanic	58.2%	25.0%	45.1%	19.0%
African American	11.5%	7.5%	3.6%	1.8%
Other Race	30.2%	67.5%	51.4%	79.3%
Observations	79,105	85,144	102,437	123,341

NOTE: A sample of all discharges of patients aged 19 or less who are insured by Medicaid or a commercial insurance carrier for which main procedure in the discharge record is included in the most common pediatric procedures list (See appendix B for details on the generation of the list).

TABLE 5
Effect of Reform on Pediatric Surgery by Attractiveness Group

	Reform		Texas 2001		CA 2003	
	(1)	(2)	(3)	(4)	(5)	(6)
Attractiveness_indexhighXReform	0.1833 (0.0351)	0.1955 (0.0351)	-0.0245 (0.0528)	-0.0245 (0.0535)	0.0676 (0.0346)	-0.0047 (0.0366)
Attractiveness_index_lowXReform	0.0643 (0.0336)	0.0578 (0.0336)	0.0162 (0.0501)	0.0347 (0.0521)	0.0730 (0.0308)	-0.0235 (0.0334)
Attractiveness index	yes	yes	yes	yes	yes	yes
Procedure	yes	yes	yes	yes	yes	yes
Reform	yes	yes	yes	yes	yes	yes
Hospital	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes
HospitalXYear	no	yes	no	yes	no	yes
F-test for equality of reform effect (Prob>F)	0.0005	0.0000	0.496	0.329	0.878	0.581
Observations	10,201	10,201	4,016	4,016	11,986	11,986

NOTE: Panel A shows estimation results of regression (10). Panel B presents results from analysis of a fictitious reform in the beginning of 2001. Panel C presents results from a regression analysis of CA assigning each procedure the attractiveness proxy from Texas. Standard errors are reported in parentheses. Each regression includes a constant. Dependent variable in all models is log ratio of commercial procedures to Medicaid procedures.

TABLE 6
Effect of Reform on Pediatric Surgery

	Reform		Texas 2001		CA 2003	
	(1)	(2)	(3)	(4)	(5)	(6)
Attractiveness_indexXPost_Reform	0.1908 (0.0704)	0.2391 (0.0682)	0.0026 (0.1142)	0.0112 (0.1156)	-0.1048 (0.0744)	-0.0313 (0.0712)
Procedure Fixed Effect	yes	yes	yes	yes	yes	yes
Reform	yes	yes	yes	yes	yes	yes
Hospital	yes	yes	yes	yes	yes	yes
Year	yes	yes	yes	yes	yes	yes
HospitalXYear	no	yes	no	yes	no	yes
Observations	10,201	10,201	4,016	4,016	11,986	11,986

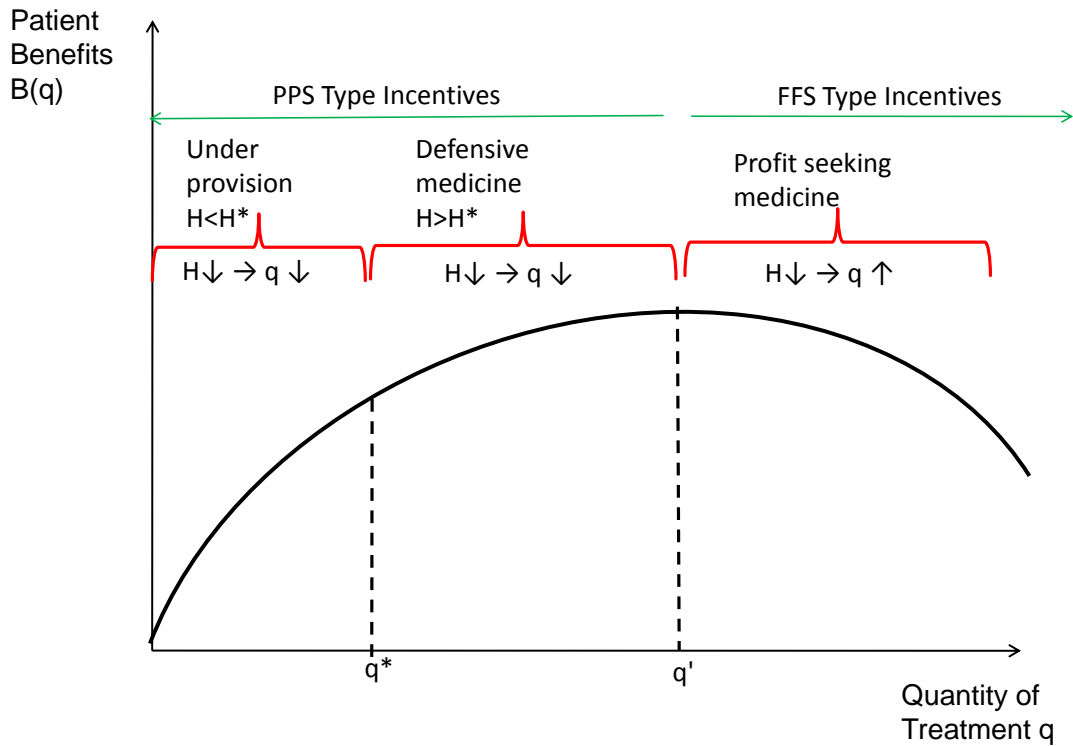
NOTE: Panel A shows estimation results of regression (11). Panel B presents results from analysis of a fictitious reform in the beginning of 2001. Panel C presents results from a regression analysis of CA assigning each procedure the attractiveness proxy from Texas. Standard errors are reported in parentheses. Each regression includes a constant. Dependent variable in all models is log ratio of commercial procedures to Medicaid procedures.

TABLE 7
Procedure Incidence by Attractiveness Tercile

Low		Medium		high	
Orchiopexy	575	Femoral Division Nec	500	Dorsal/Dorsolum Fus Ant	534
Other Local Destruc Skin	694	Tonsillectomy	591	Cl Red-Int Fix Tib/Fibu	673
Destroy Loc Lung Les Nec	793	Musc/Tend Lng Change Nec	651	Bilat Ind Ing Hern Rep	780
Tot Repair Tetral Fallot	892	Prost Repair Ventric Def	735	Percu Endosc	899
Cruciate Lig Repair Nec	977	Revis Cleft Palat Repair	883	Gastrostomy	899
Spinal Struct Repair Nec	990	Local Destr Ova Les Nec	947	Open Reduct Mandible Fx	1,030
Total Splenectomy	1,066	Repair Of Cleft Lip	955	Free Skin Graft Nec	1,182
Repair Of Gastroschisis Nonexcis Debridement Wnd	1,090	Pectus Deformity Repair	1,027	Nephroureterectomy	1,212
Other Craniotomy	1,263	Oth Uni Salpingo-Oophor	1,038	Other Gastrostomy	1,342
Internal Fixation-Femur	1,389	Seg Osteoplasty Maxilla	1,340	Oth Periton Adhesiolysis	1,491
Systemic-Pulm Art Shunt	1,399	Peritoneal Incision	1,461	Cranial Osteoplasty Nec	1,659
Decortication Of Lung	1,546	Peritonsillar I & D	1,508	Dorsal/Dorsolum Fus Post	2,289
Correct Ureteropelv Junc	1,706	Ventriculostomy	1,522	Part Sm Bowel Resect	2,314
Open Red-Int Fix Humerus	2,262	Cleft Palate Correction	1,608	Nec	2,314
Op Red-Int Fix Tib/Fibul	3,526	Closed Red-Int Fix Femur	2,056	Other Brain Excision	2,403
Clos Red-Int Fix Humerus	4,229	Open Reduc-Int Fix Femur	2,399	Myringotomy W Intubation	3,033
Exc Wound Debridement	6,511	Op Red-Int Fix Rad/Ulna	2,689	Tonsillectomy/Adenoidec	3,733
Lap Appendectomy	19,790	Ventricl Shunt-Abdomen	2,785	Occlude Thoracic Ves	4,062
		Ureteroneocystostomy	3,536	Nec	4,062
		Replace Ventricle Shunt	4,079	Laparoscopic Cholecystec	7,758
		Creat Esophagastr Sphinc	4,985	Pyloromyotomy	8,752
		Other Appendectomy	29,967		
Total	51,841		67,262		45,146

NOTE: Procedure names appear in the shorthand form that is used in the HCUPNET database.

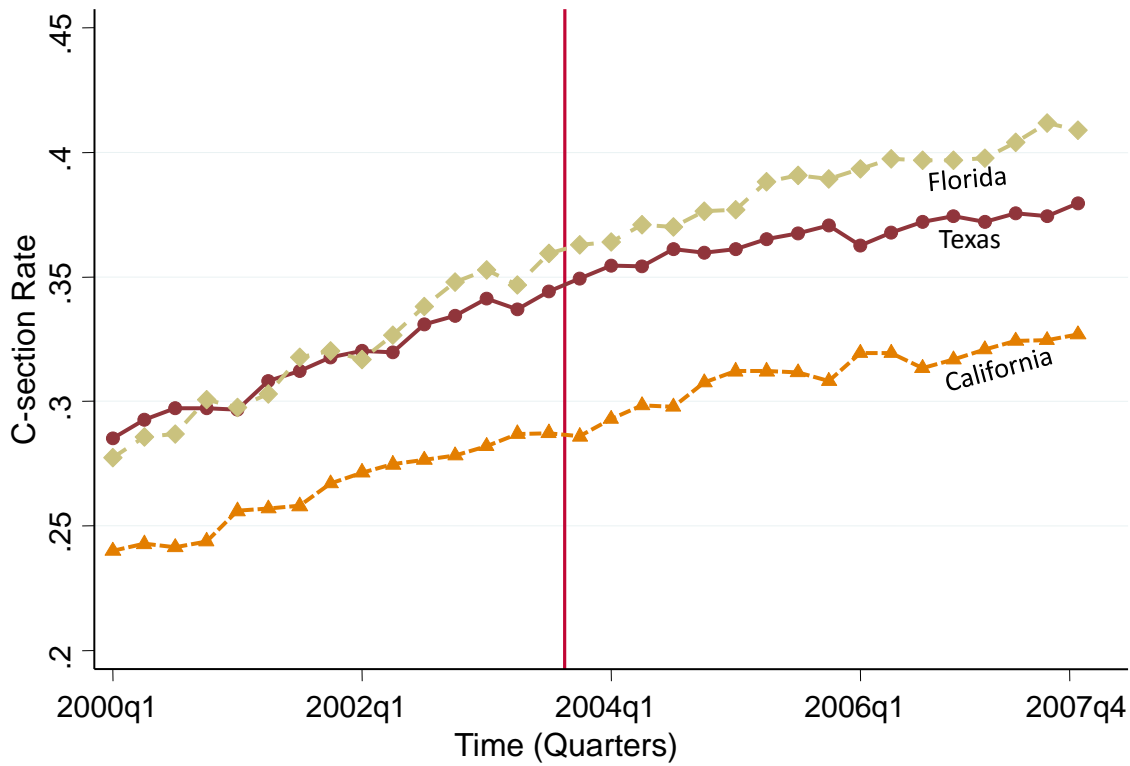
Figure 1
The Effect of a Liability Decreasing Reform On Treatment



1

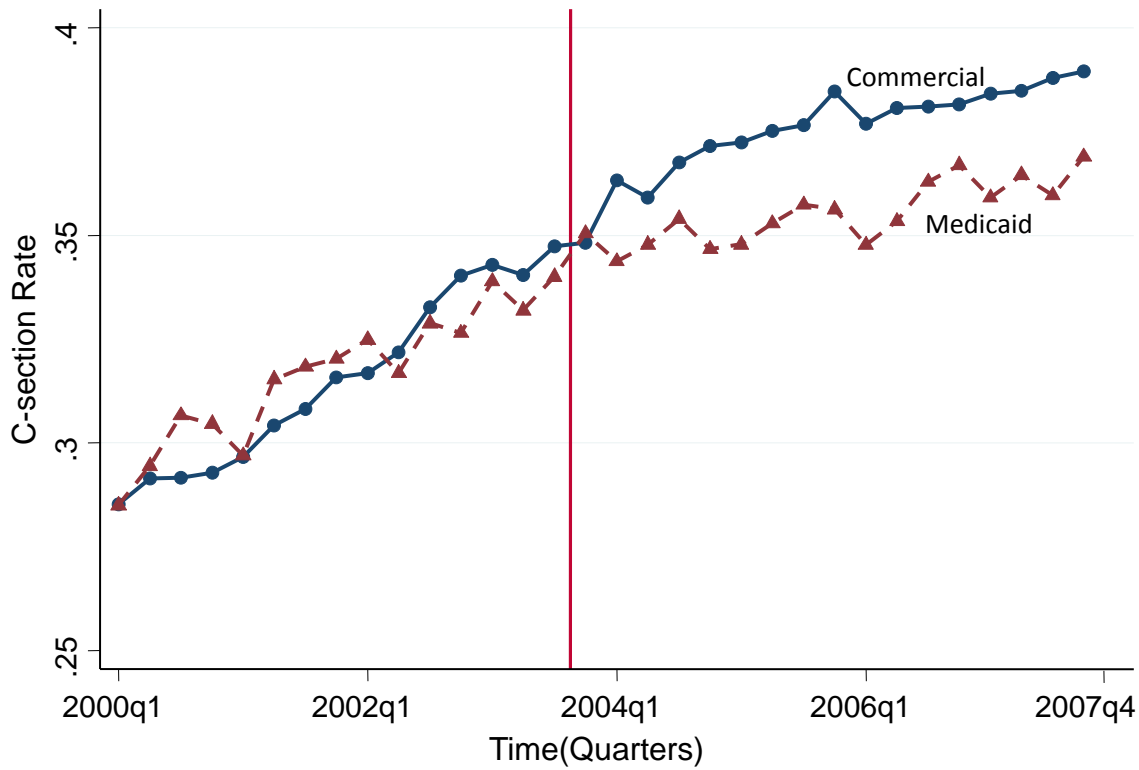
NOTE: This figure illustrates the response of a healthcare provider to a liability decreasing tort reform. There are two types of financial incentives: (1) Fee For Service, in which healthcare is provided in the region $q > q'$. (2) Prospective Payment System, in which healthcare is provided in the region $q < q'$.

Figure 2
C-section Rate: TX, FL & CA



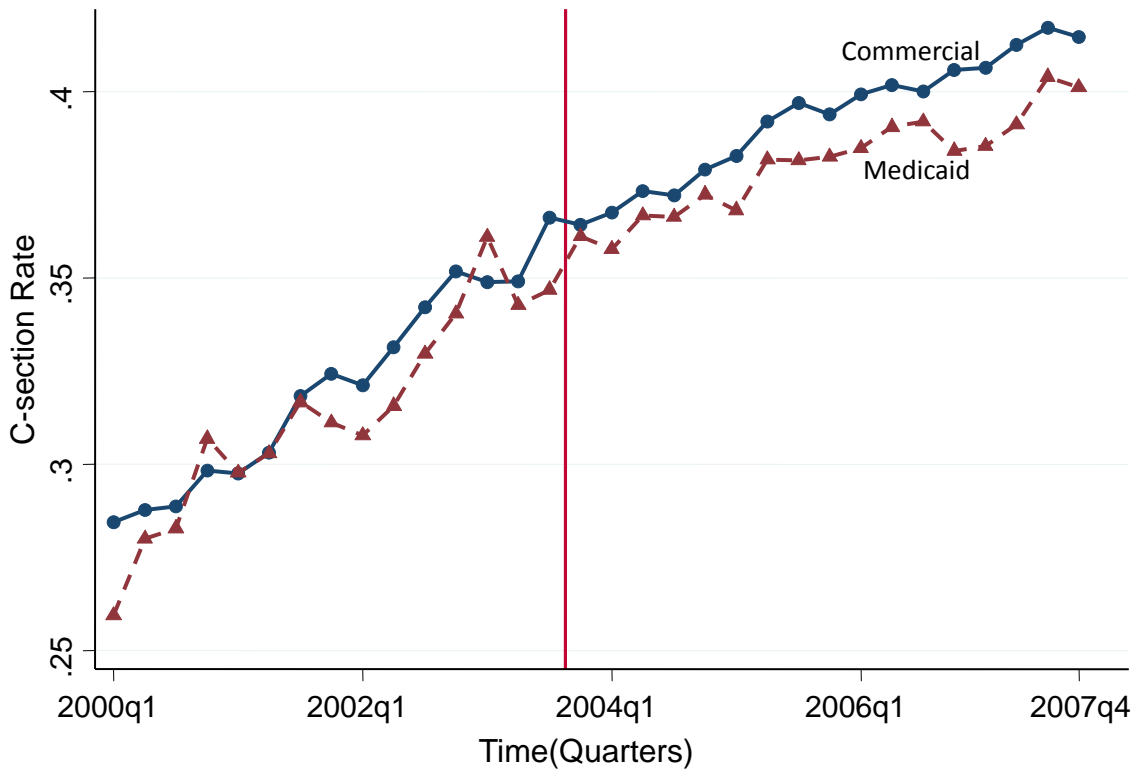
NOTE: This figure plots quarterly C-section rates in Texas Florida and California for mothers aged 25-34. The solid vertical line (separating quarters 2003-Q3 and 2003-Q4) denotes the time at which the Texas reform was enacted. The figure was constructed using Inpatient data from those three states.

Figure 3a
C-section Rate Medicaid vs. Commercial, TX



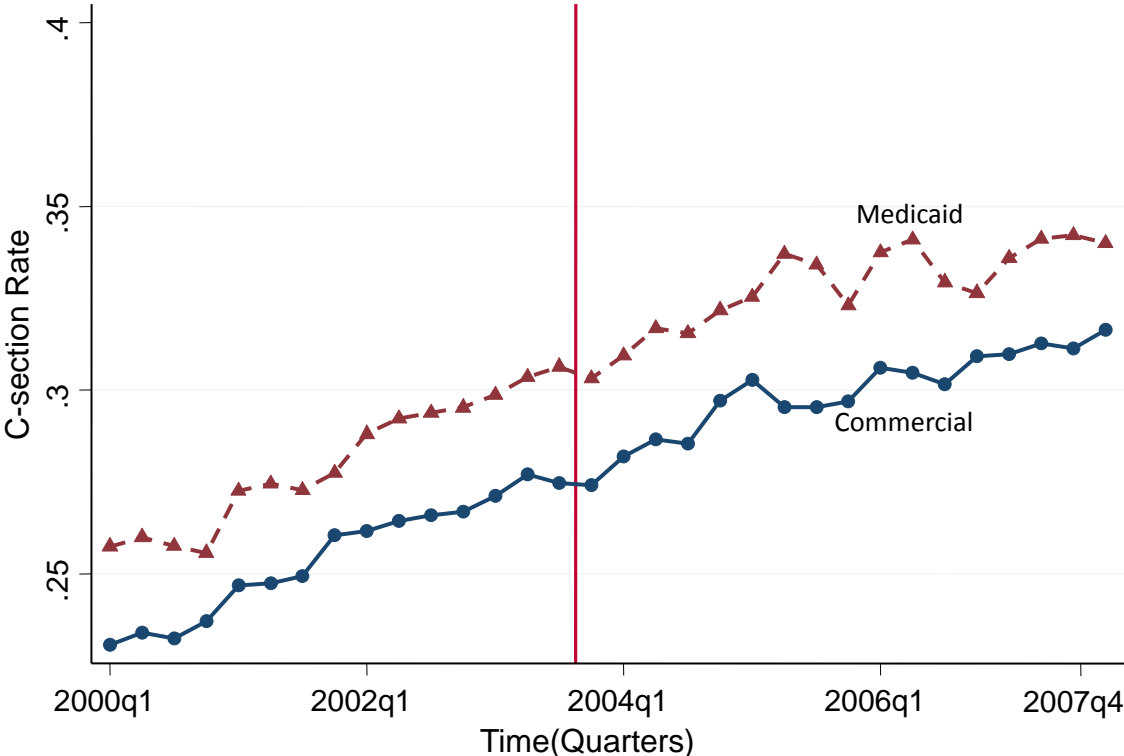
NOTE: This figure plots quarterly C-section rates in Texas for mothers aged 25-34 insured by a commercial carrier and by Medicaid. The solid vertical line (separating quarters 2003-Q3 and 2003-Q4) denotes the time at which the Texas reform was enacted. The figure was constructed using the Texas Inpatient Data.

Figure 3b
C-section Rate Medicaid vs. Commercial, FL



NOTE: This figure plots quarterly C-section rates in Florida for mothers aged 25-34 insured by a commercial carrier and by Medicaid. The solid vertical line (separating quarters 2003-Q3 and 2003-Q4) denotes the time at which the Texas reform was enacted. The figure was constructed using the Florida Inpatient Data.

Figure 3c
C-section Rate Medicaid vs. Commercial, CA



NOTE: This figure plots quarterly C-section rates in California for mothers aged 25-34 insured by a commercial carrier and by Medicaid. The solid vertical line (separating quarters 2003-Q3 and 2003-Q4) denotes the time at which the Texas reform was enacted. The figure was constructed using the California Inpatient Data.

Figure 4a
C-section Rate Medicaid vs. Commercial, Low-Risk

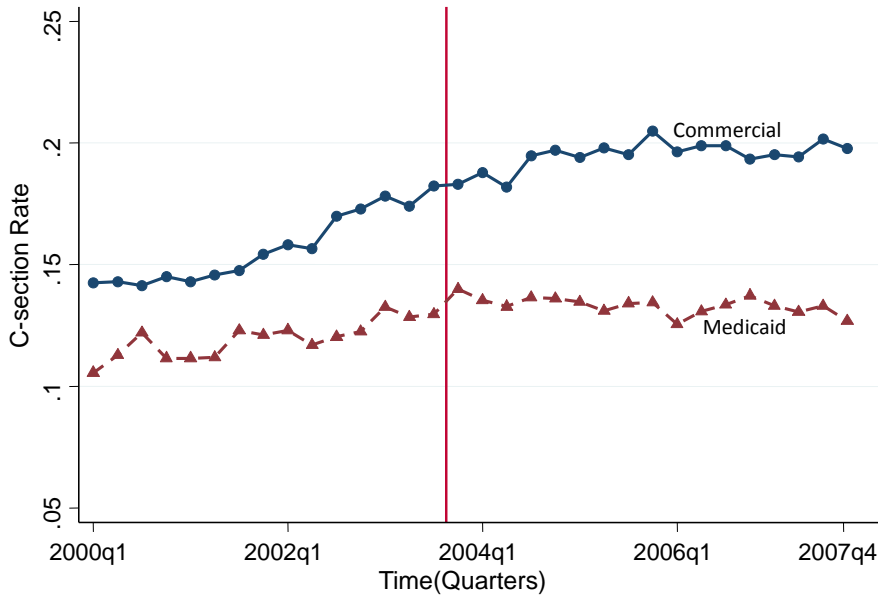
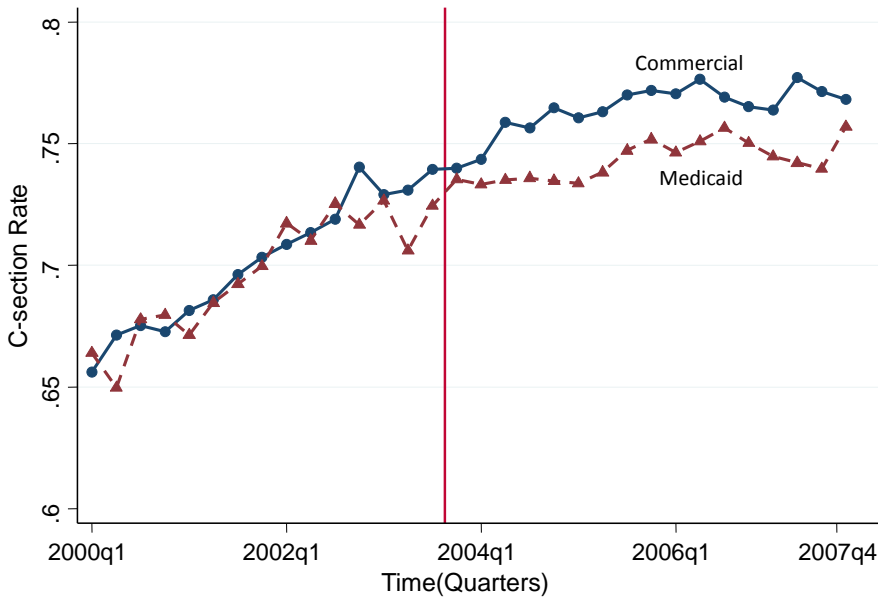


Figure 4b
C-section Rate Medicaid vs. Commercial, High-Risk



NOTE: These figures plot quarterly C-section rates in Texas for mothers aged 25-34 insured by a commercial carrier and by Medicaid for high-risk and low-risk mothers. The solid vertical line (separating quarters 2003-Q3 and 2003-Q4) denotes the time at which the Texas reform was enacted. High-risk is defined as a discharge with one of the following diagnoses: Previous C-section, breech position, early onset, polyhydramnios, oligohydramnios, obesity, diabetes, multiple gestation, distress, hypertension and hemorrhage. The figures were constructed using the Texas Inpatient Data.

Figure 5a

Ratio of Commercial to Medicaid Surgeries High and Low Tercile Attractiveness, TX

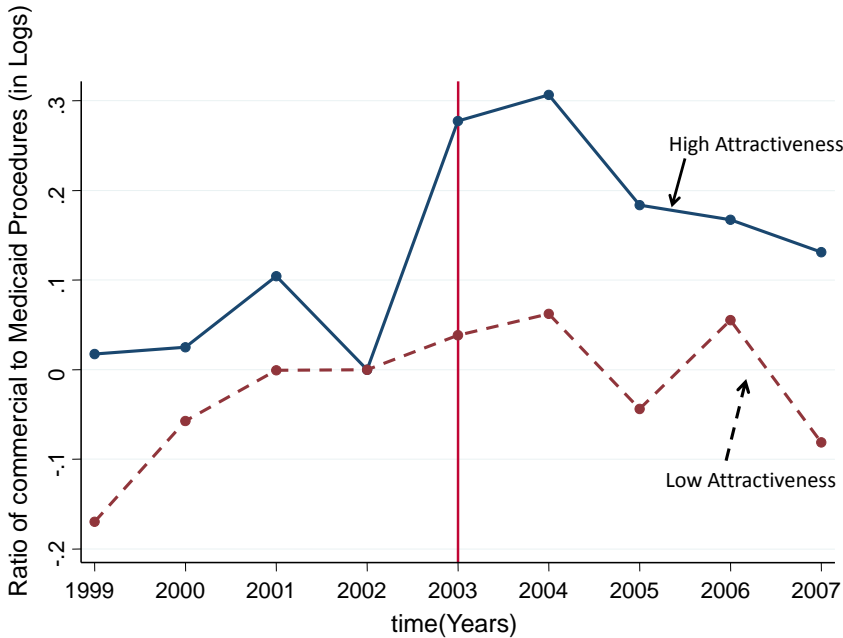
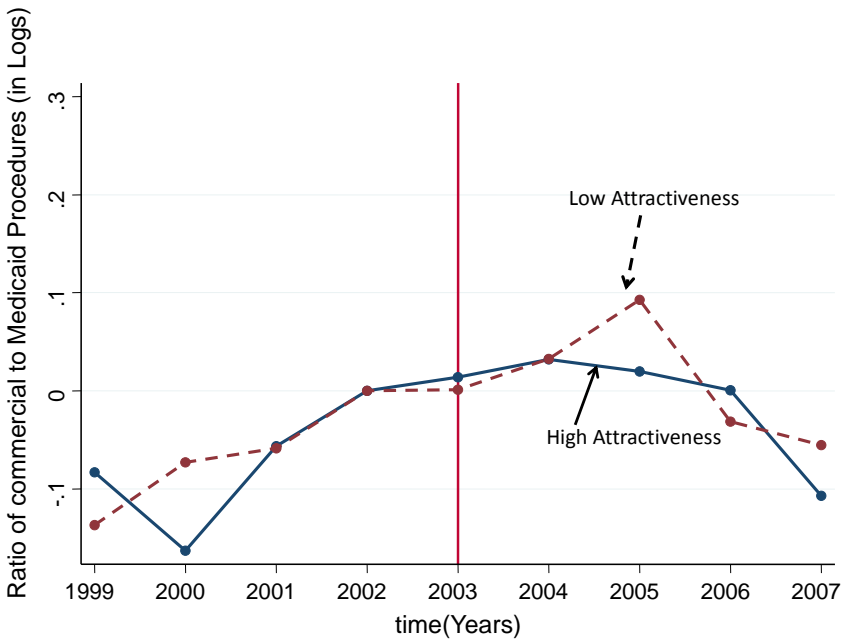


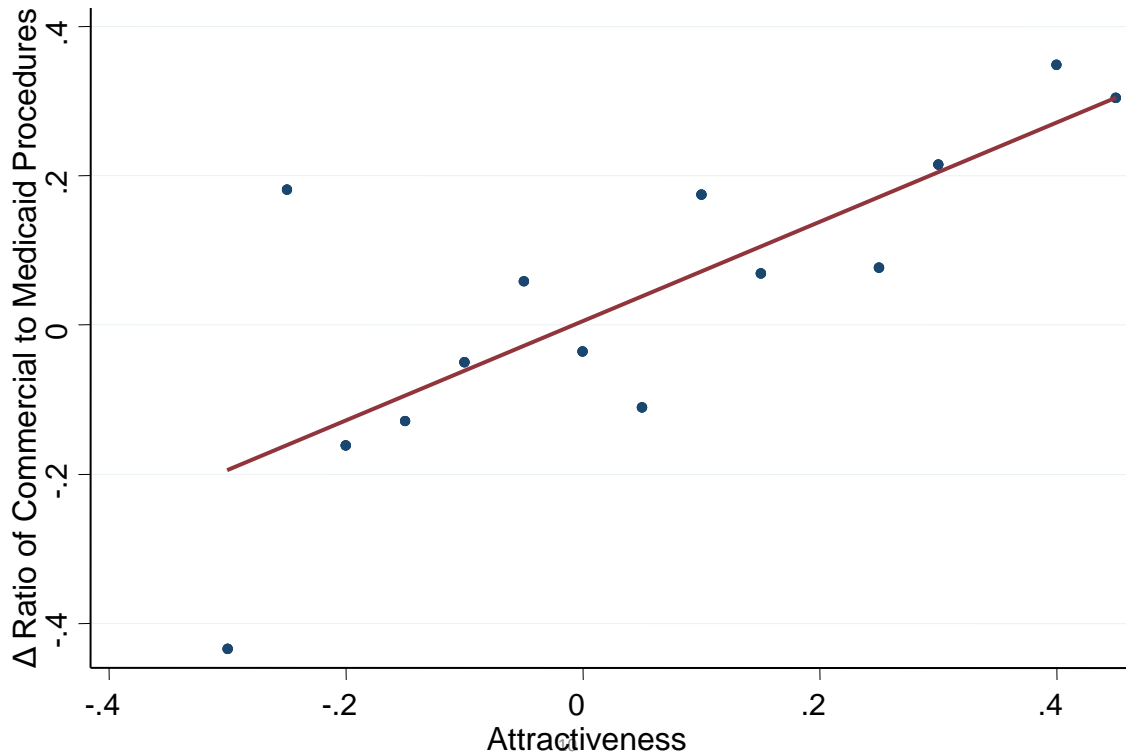
Figure 5b

Ratio of Commercial to Medicaid Surgeries High and Low Tercile Attractiveness, CA



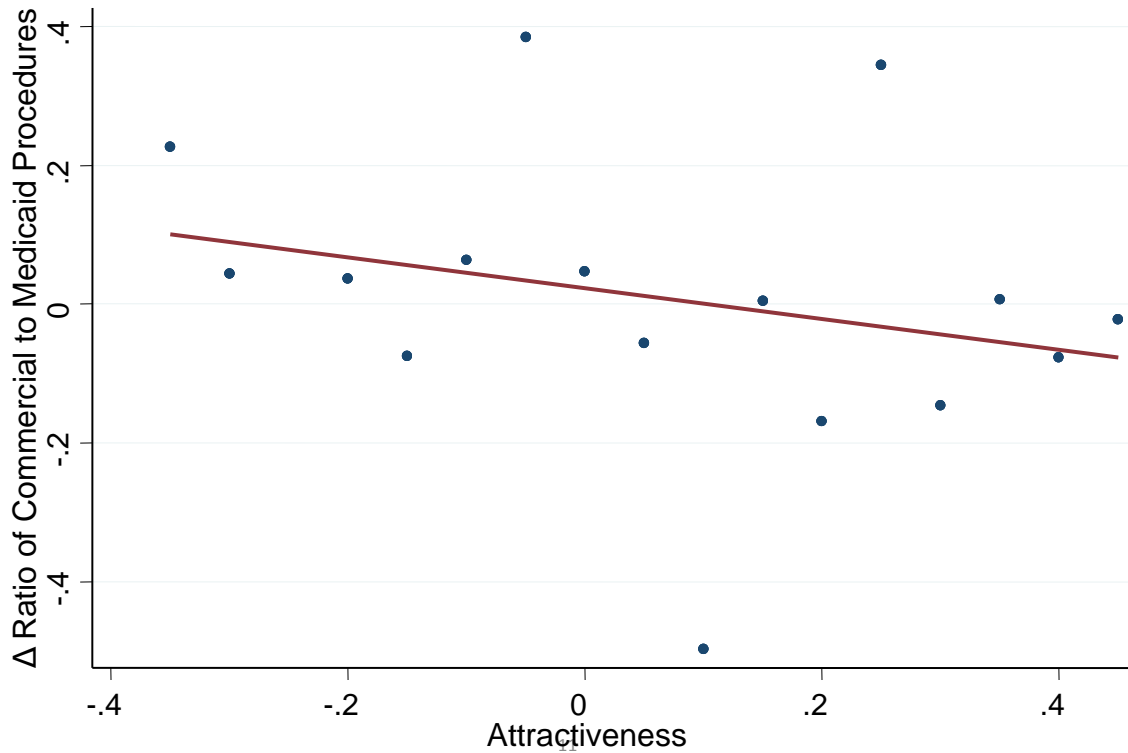
NOTE: Panel A plots annual ratios of pediatric surgeries in commercially insured patients to pediatric surgeries in Medicaid patients for the period 1999-2007, with controls. The common pediatric surgeries data (described in text) was used. The curve reports dummy coefficients of the interaction between year and high and low attractiveness proxies from an OLS regression with hospital fixed effects. Panel B is done in an analogous way using the California common pediatric surgery data and assigning each procedure the Texas attractiveness index.

Figure 6a
Change in Ratio of Commercial to Medicaid Surgeries Pre-Post Reform by
Attractiveness, TX



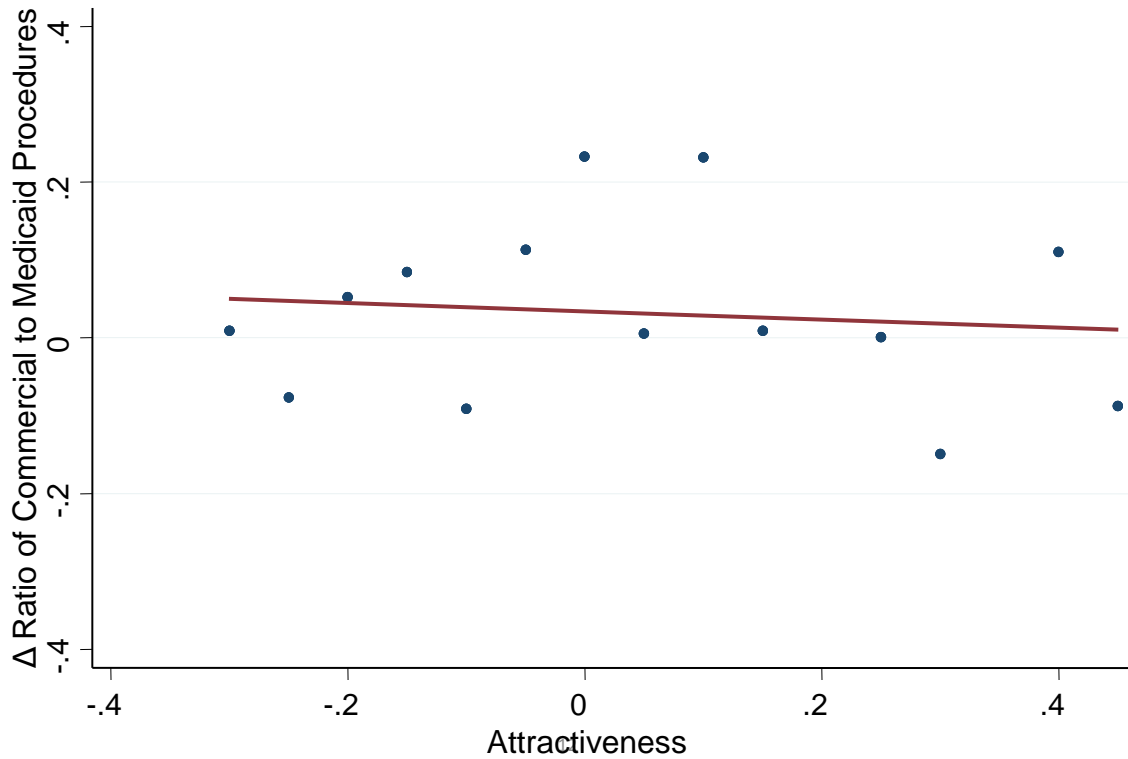
NOTE: This figure plots percentage change in the ratio of patients insured by a commercial carrier to patients insured by Medicaid following the reform (between 2002 and 2004), against the attractiveness proxy. To construct the figure I pooled attractiveness proxies in 0.05 bins. For each bin I calculated the mean percentage change of the ratio of commercial to Medicaid surgeries, controlling for year and hospital fixed effects. The sample and data are described in the text.

Figure 6b
Change in Ratio of Commercial to Medicaid Surgeries Pre-Post Reform by
Attractiveness, TX 2001



NOTE: This figure plots percentage change in the ratio of patients insured by a commercial carrier to patients insured by Medicaid following a fictitious reform in 2001 (between 2000 and 2002), against the attractiveness proxy. The figure was constructed in an analogous way to Figure 6(a)

Figure 6c
Change in Ratio of Commercial to Medicaid Surgeries Pre-Post Reform by
Attractiveness, CA



NOTE: This figure plots percentage change in the ratio of patients insured by a commercial carrier to patients insured by Medicaid following a fictitious reform in 2003 in California (between 2002 and 2004), against the attractiveness proxy. The figure was constructed in an analogous way to Figure 6(a), assigning the Attractiveness proxies from Texas to the California data